January 1941

TECHNOLOGY REVIEW

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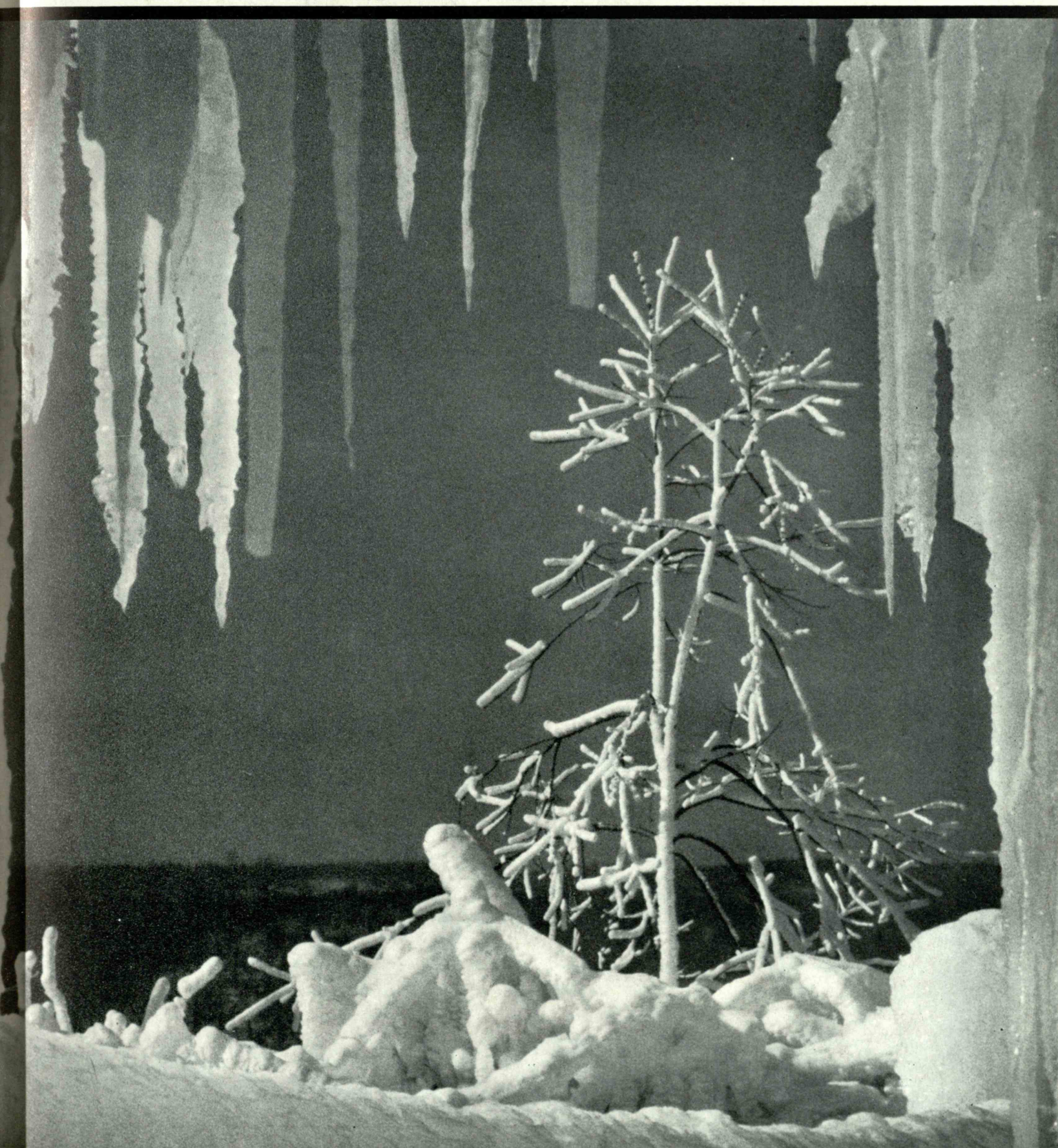

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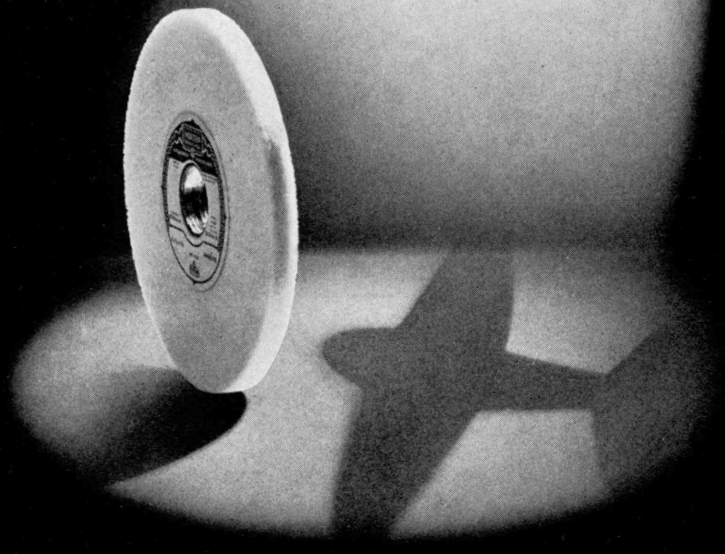

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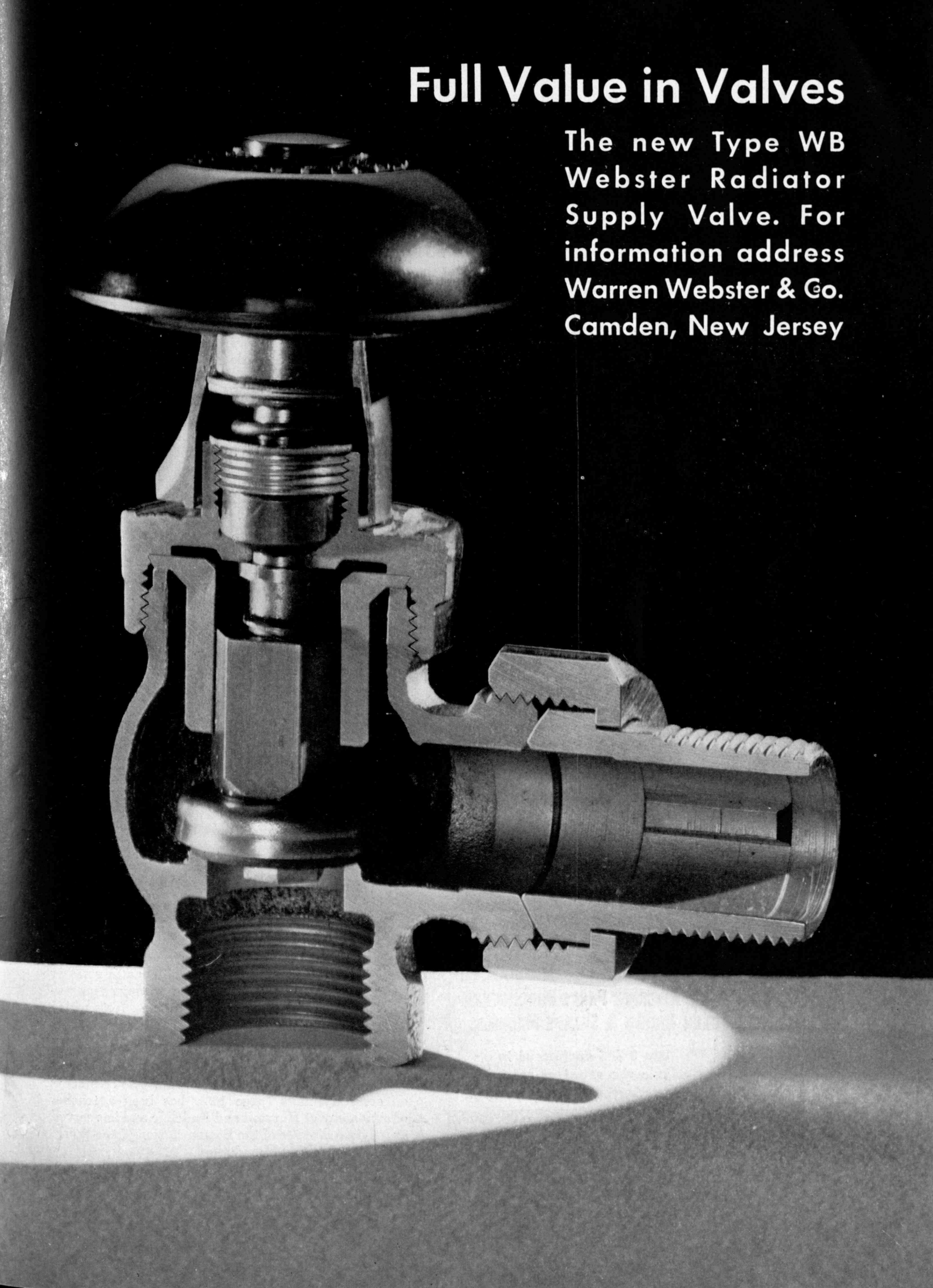
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MAIL RETURNS

Letters Requested

FROM WILLIAM C. DICKINSON, '70:

I have received your November issue, and it certainly is a dandy. You are to be heartily congratulated for the very fine work shown in this publication. From some experience I know it is a big job to edit and have printed such an extensive book as you have produced in the best of style. I notice that you refer to Professor Richards of the first Institute Class — 1868 — who must be a man of quite advanced years. . . . For myself, of the Class of 1870, I was ninety-one on September 20 and at present can recall the names of Archer, Orvis, Cross, Mason, Turner, Whitney, and Herreshoff. I should be glad to hear from any of my Class who are still alive. My address is 5929 Cates Avenue, St. Louis, Mo.

I am the author and publisher of the enclosed two booklets [dealing with religious and philosophical subjects], and I have already supplied the Technology Christian Association with some hundred copies of each. . . . I am very much interested in everything connected with the Institute and always attend our Technology Club dinners. I wish you all success with your fine publication and expect to continue to support it.

St. Louis, Mo.

Clad, Not Plated

FROM CLAYTON D. GROVER, '22:

. . . I was a little disturbed at the mention of the nickel-plated holds in the fishing trawlers described in Richard Hallet's article, "Net Returns from the Banks," in the December Review. Actually, the proper description is nickel-clad holds. Nickel plate connotes the product with which we are familiar on electrical fixtures, and so on, whereas the material used in the holds of the trawlers is quite a different one. It is a composite heavy sheet or plate composed of steel with a layer of rolled pure nickel on one or both surfaces, the nickel layer being upwards of 1/32-inch thick. The product is made by the Lukens Steel Company by forge welding a slab of pure nickel to a slab of steel and then rolling it out to the desired thickness. The forge welding is accomplished at the rolling temperature by the initial pass of the composite slab through the roll. The material is fabricated and welded by a technique similar to that used for other materials. In other words, the term "nickel plated" conveys an idea of flimsiness, whereas the nickel-clad material is strong and husky.

New York, N. Y.

A Suggestion

FROM DONALD MCC. STURZNICKLE, '28:

A statement in Alvar Aalto's article, "The Humanizing of Architecture," in the November Review impels me to make a suggestion. The statement (on page 36) is: "Bright reflection from book pages is one of the most fatiguing phenomena in reading." The suggestion is: Please plan to use a less glossy paper for The Review, even at some sacrifice in photographic clarity.

White Plains, N. Y.

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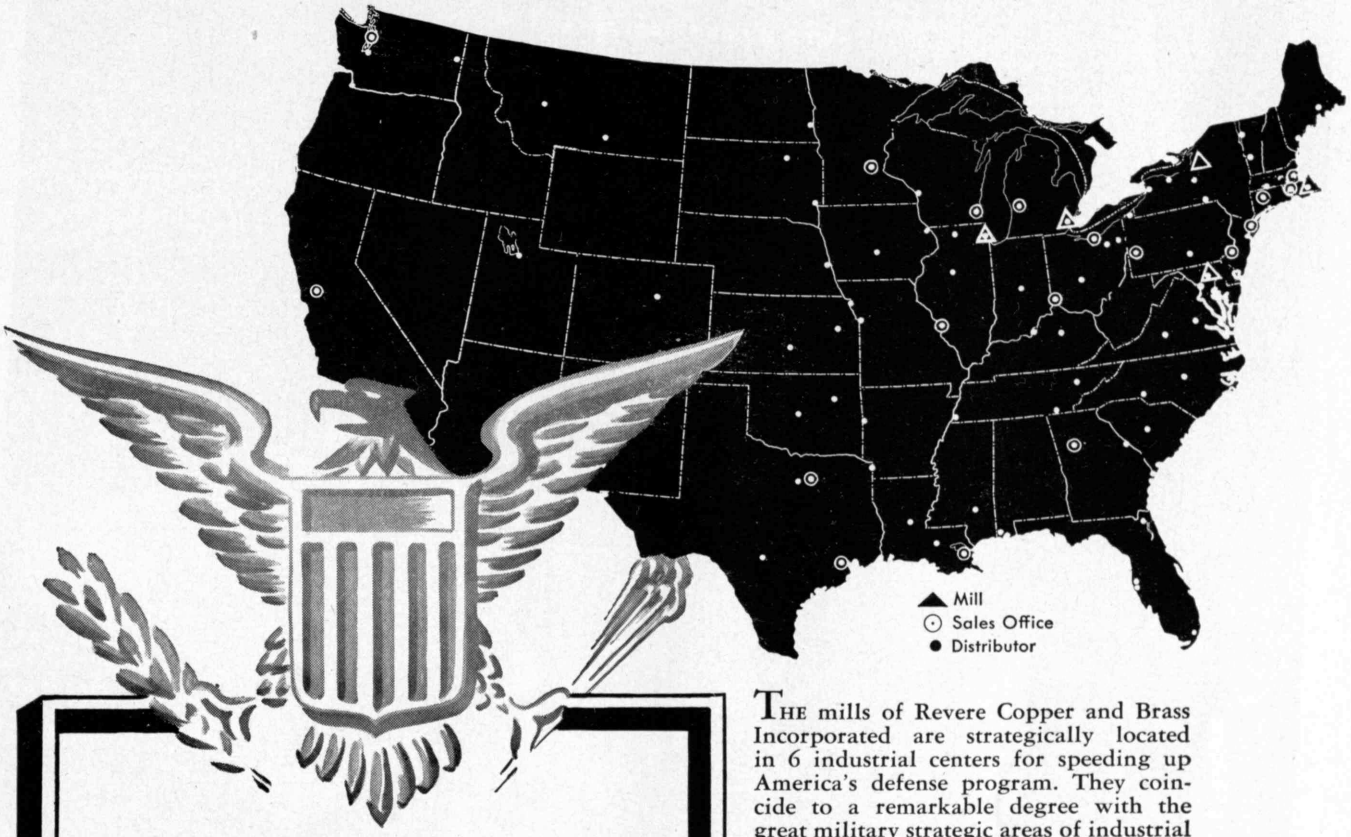
STRATEGIC POSTS FOR INDUSTRY



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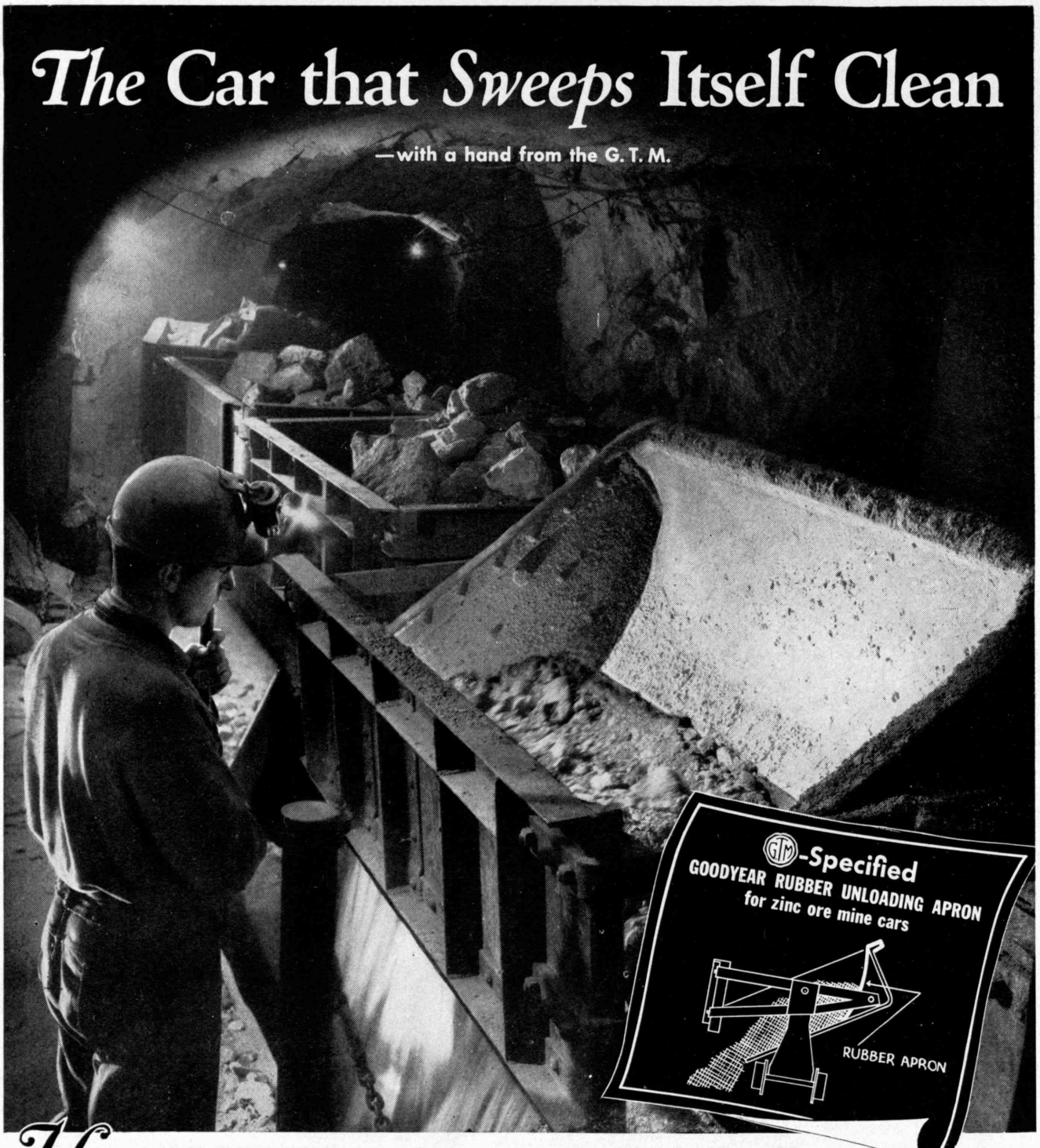
—with a hand from the G. T. M.



Here you see how a bottleneck in a large zinc mine was broken, through an ingenious application of rubber by the G. T. M.— Goodyear Technical Man. Dump cars that wouldn't dump were the trouble. Wet, soggy ore was the reason. Ore stuck so tenaciously inside the cars, particularly in the lower back corner, that a third or more of every load had to be laboriously scraped out by hand — a slow costly operation. Since wet ore does not adhere to rubber, the G. T. M.'s answer to this sticker was to line the back of the cars with an apron of tough, smooth Goodyear Armadillo rubber-sheeting, firmly clamped at the top, free to swing at the bottom. Now, when a car dumps, the rubber apron swings forward, sweeping the ore before it and emptying the load in a jiffy. *This installation is typical of scores of new uses of rubber developed by the G. T. M. to expedite the handling of all types of materials from zinc to acids. To consult him on your problem, write Goodyear, Akron, Ohio, or Los Angeles, California — or phone the nearest Goodyear Mechanical Rubber Goods Distributor.*

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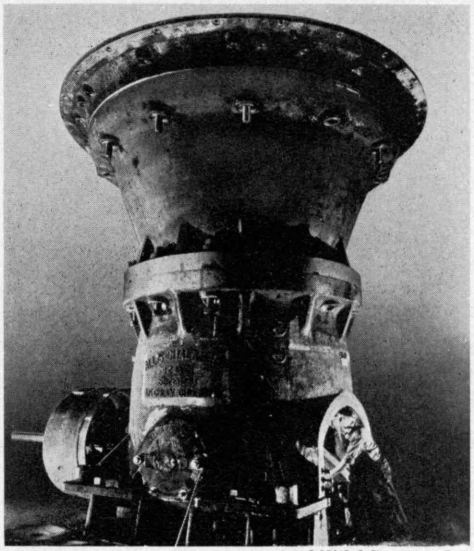

International Nickel Company, Inc.

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VOLUME 43 NUMBER 3

THE TECHNOLOGY REVIEW

TITLE REGISTERED U. S. PATENT OFFICE

EDITED

AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

CONTENTS for JANUARY, 1941

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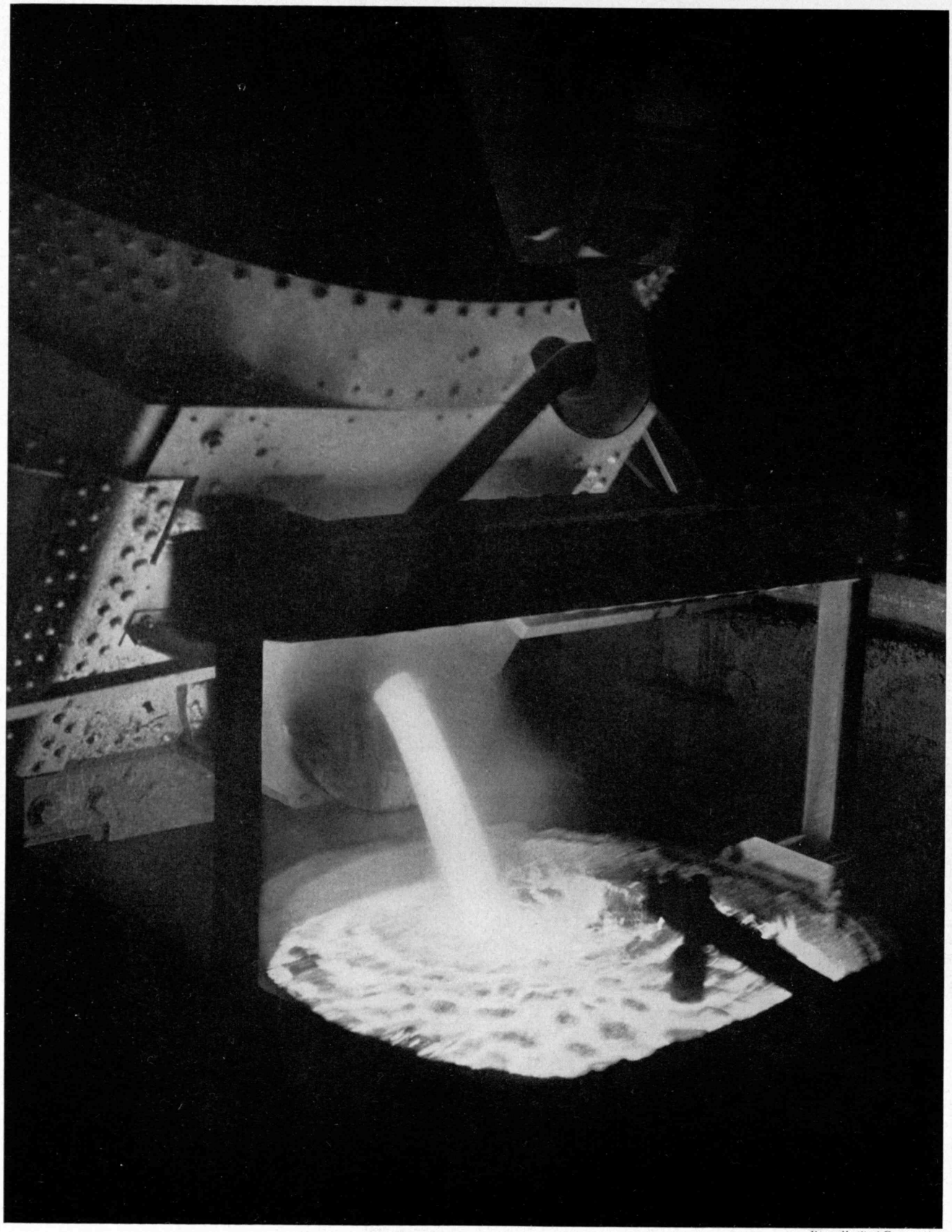


Republic Steel Corporation

Flowing Metal

THE
TECHNOLOGY
REVIEW

Vol. 43, No. 3

January, 1941

The Trend of Affairs

Refrigeration Up to Date

ONLY a few years ago, milk was poured into shallow pans to cool on the hard, damp earth in farmhouse cellars. Butter was packed in dun glazed crocks and gently lowered into the cold water of the spring. Vegetables were buried in root cellars, and housewives fretted over hot stoves canning beets and beans and fruit. Meats were smoked, pickled in barrels of brine, or boiled and sealed in jars against the unreasoning demands of winter appetites. Even after the ponds gave up their ice when the household refrigerator came into general use, diets — particularly in the country — were limited, and the question, winter or summer, was, "Will the food keep?"

The milk pan has disappeared from the cellar floor, and fewer mice now die by drowning; the spring in the meadow no longer serves as a refrigerator; and vegetables are free of the musty flavor of the root house. Beans and beets and fruit are still being canned, but fresh vegetables are available to those who desire them. Even cider, the enjoyment of which was once the most exciting of rural adventures, is protected against fermentation, but refrigeration cannot be blamed for that.

Commercial cold storage, domestic mechanical refrigeration, and quick freezing have answered for all time the question, "Will it keep?" Seasonal restrictions on foods have largely been removed, and well-balanced diets are now available throughout the year.

Like many other advances in science and engineering, improvement in the storage and preservation of food has been taken for granted. Now, however, the increasing fury of the most destructive war in history focuses attention on the enormous importance of refrigeration and its biological significance, for when blockades close normal channels of trade, protection of accumulated food stores is vital to every nation.

The extent to which the peoples of the world are dependent upon refrigeration for preservation of their food materials is shown in a report just issued by the committee on biology of the American Society of Refrigerating Engineers. Bernard E. Proctor, '23, Associate Professor of Food Technology at the Institute, is chairman of the committee, whose other members include Gerald A. Fitzgerald, '23, and Milton E. Parker, '23. The report, "Recent Advances in Refrigeration Biology," brings news of the problems of food protection in England and on the Continent under war conditions and reveals not only that people are issued gas masks but that cold-storage food warehouses are equipped with air-conditioning scrubbers to remove the poison gases of war from incoming air.

In England gas-tight steel chambers for refrigerated storage of eggs in carbon dioxide have been provided to assure safekeeping of this important food. War has also brought into use in England a refrigeration apparatus specially devised to store human blood for emergency purposes at temperatures between 34 and 38 degrees Fahrenheit. The secret of the success of the apparatus is said to be the prevention of even the slightest amount of shaking, thus allowing undercooling of the proteinaceous bodies without denaturation.

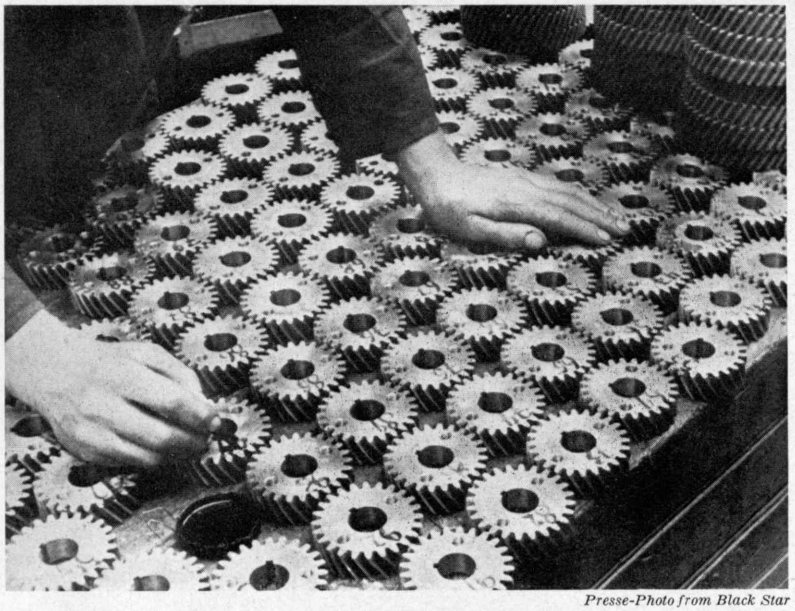
In this country numerous reports have appeared in medical literature on the use of refrigeration in the treatment of diseases. The best that can be said at present is that refrigeration has been shown to be helpful in relieving pain; any other benefits in low-temperature therapy are yet to be demonstrated. The use of air conditioning in hospitals, however, has improved the comfort of patients.

Refrigeration has been a boon to the florist for many years. Before the present war one of the largest uses of carbon-dioxide ice in Holland was to lower the temperature of flowers shipped by airplane to the big cities of

Europe. Gladiola blooms have recently been quick frozen and stored in this country. What the development may mean to floriculture depends on how many other flowers are capable of similar treatment.

Food poisoning caused by staphylococci has been much more common in recent years. Although no relation has been indicated between this disease and frozen foods, it is of interest that Canadian scientists have demonstrated that staphylococcic poisoning cannot come from frozen foods which are thawed and kept below 50 degrees Fahrenheit before cooking.

Ice containing small amounts of nitrites has recently been advocated by Canadian authorities for use in the fishing industry and has been cited as beneficial for the packing of cod and salmon. The ice is not applicable to halibut because of a resulting discoloration. Investigations relating to the possible use of hydrogen peroxide in ice are now being carried on in this country.



Presse-Photo from Black Star

Order — finished gears being readied for assembly

The recent discovery that ground peanuts release their oil content much more readily if subjected to freezing may lead to elimination of the use of heat treatment in producing virgin oil.

The value of carbon dioxide as an adjunct to the refrigeration of fruits in storage and in transit becomes more and more evident. Carbon dioxide has proved particularly helpful in extending the storage life of peaches, plums, cherries, and pears in long-distance shipments. Precooling of fruits and vegetables is definitely on the increase, and hydrocooling for such products as celery and broccoli has become more widely appreciated as a conservation measure before long shipments are started. The need for treatment as soon as possible after harvesting is also better realized. A few hours at that time may be the equivalent of as many days in the total storage life of the product.

Sulphur-dioxide fumigation of grapes before refrigerated shipment or storage has proved beneficial in lowering the incidence of molds and rots but does not appear applicable to other fruits unless a different gas is used, since sulphur dioxide injures many fruits.

Various kinds of nuts are refrigerated to prevent insect infestation. Pecans have been found to be particularly sensitive to ammonia, as low a concentration as .01 per cent causing discoloration. Almonds are less susceptible, and walnuts are affected comparatively little.

To destroy the cigarette weevil, which frequently infests tobacco, refrigeration has been found very useful. Restricted exportation of tobacco during the past year has caused the refrigerated storage of it to increase tremendously, as no damage by weevils will occur at the lower temperatures.

According to estimates, about 600,000,000 pounds of frozen foods were produced in 1940, with some 3,200 cold-storage locker plants handling 250,000,000 pounds of products from the farms of our country. Farm freezers are being purchased in considerable numbers, especially in areas where public refrigeration is lacking. These trends seem to indicate that refrigeration is now appreciated to an extent which a decade ago would scarcely have been believed. The health of rural populations, for whom well-balanced diets have been rare in the winter, will be vastly improved by facilities which enable them to enjoy their own meats and vegetables during off seasons.

The proper control of the vast stores of frozen foods is a matter of great importance from both the standpoint of health and that of economics. If proper temperatures are maintained and the foods are of good quality before being frozen, no difficulties are likely from a health standpoint. Microbiological tests, by helping to determine the quality of food, perform a useful role although they are not the sole index of quality. Vitamin content, which is also a factor in quality, has an important role in the health-promoting qualities of foods and is becoming another yardstick useful in evaluating the care with which certain foods have been handled previous to being frozen.

The proper protection of foods in storage has become so important that new packaging materials, containers, and packaging methods have been evolved to combat dehydration and the resulting deterioration in appearance and flavors which may occur simultaneously. To be of the greatest protection against dehydration, packaging must be secure against moisture vapor and capable of an absolutely tight seal.

Certain changes in the form in which foods are offered to the public have also appeared. Eviscerated poultry and cut poultry will soon be the rule rather than the exception. Frozen eggs have practically replaced shell eggs for commercial uses. Frozen cream, deaerated before being frozen, is common, and frozen sweet-cream butter is one very satisfactory means of storing fat.

Refrigeration in America is helping in the solution of many problems of food preservation, and its potentialities for maintaining the health standards of the people in case of a national emergency constitute one of the most reassuring prospects of preparedness in the Western Hemisphere.

The Strait and Narrow

ACCORDING to the observations of a hospital situated near a transcontinental highway in rural New York, the safest driving conditions are in foggy weather on snowy or icy roads with many curves and intersections. Thus again is pointed out the principle about which revolved the article "Motor Necrology" in the December Review.

Speed is the greatest cause of fatal accidents. Most automobile injuries (over 80 per cent) treated at this New York hospital occurred in cars going straight ahead; many of the accidents did not even involve collision with another car. A large proportion of them did not occur under difficult driving conditions but on open country roads in clear, dry weather, and more frequently on summer week ends than at other times. Many of the injuries were serious, the average stay at the hospital being practically three weeks.

Enlightening also is the knowledge that metropolitan New York, with 55 per cent of the population and 60 per cent of the accidents, has only 30 per cent of the fatalities; whereas rural New York, with 15 per cent of the population, has 40 per cent of the fatalities. As the report bleakly concludes: "Excessive speed and lack of acquaintance with the hazards of the open road are responsible for most automobile accidents on rural highways."

Comet in the West

BY LORING ANDREWS

REACHING its greatest brilliance early this month, Comet Cunningham, which became visible to the naked eye in December, is the first comet worth crowing about since 1910, when two, one of them Halley's, blazed in the sky. At the time it first became discernible, the new comet's head lay about halfway between bright blue-white Vega, dipping low in the Northwest, and less bright Altair, equally low in the West. When maximum brilliance is attained, the head will have moved to the left and below Altair. The comet's tail will stretch each night to the right, or northward, almost parallel to the horizon.

Just how bright the comet will be and how long a tail it will have early this month are matters for speculation. Astronomers are predicting that its greatest brightness will rival that of the planet Jupiter, which now graces the southern quadrant of the sky each night. As for the tail, the fact that the comet already possessed one when discovered augurs a tail of great extent, rivaling that of Halley's comet.

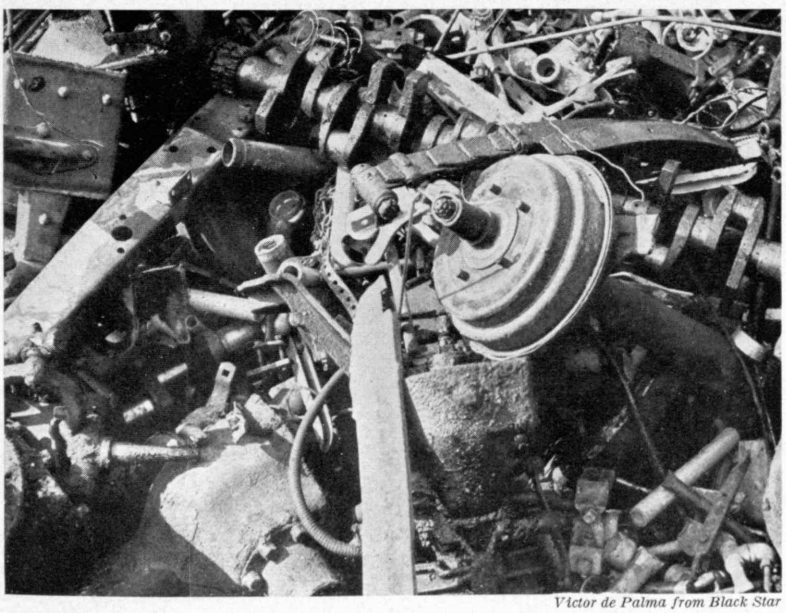
As usual, the astronomers were the ones who received the advance notices of the forthcoming attraction. Leland E. Cunningham of the Harvard Observatory took over the coveted role of producer's representative. Poring routinely over an astronomical photograph taken by the observatory on September 5, he came across the comet's imprint amid the host of star images. Like most cometary discoveries, this one was an accident. The finder has already received the customary reward — the comet has been named for him.

When it was discovered, nothing was known about the comet except that it was so faint that only a telescope could make it visible. But word went around, and several observatories immediately set to work to photograph the newcomer from night to night, recording a permanent history of its life. Give astronomers a few days to accumulate evidence, and a comet's travels are no longer a secret.

Cunningham's comet probably started its journey earthward and sunward shortly after the fall of the Roman Empire, from a point approximately fifteen billion miles away — a distance more than eleven billion miles beyond the present outer boundary of the solar system defined by the orbit of the planet Pluto. For centuries the comet dawdled in the outer reaches of the solar system and beyond, slowly accelerating under the sun's gravitational pull, until, at the time of its discovery, the comet was flying high over the orbit of Mars at the lazy cosmic speed of thirteen miles a second. As it approached naked-eye visibility, the comet swept in, from above and behind, upon an earth retreating along its orbit about the sun.

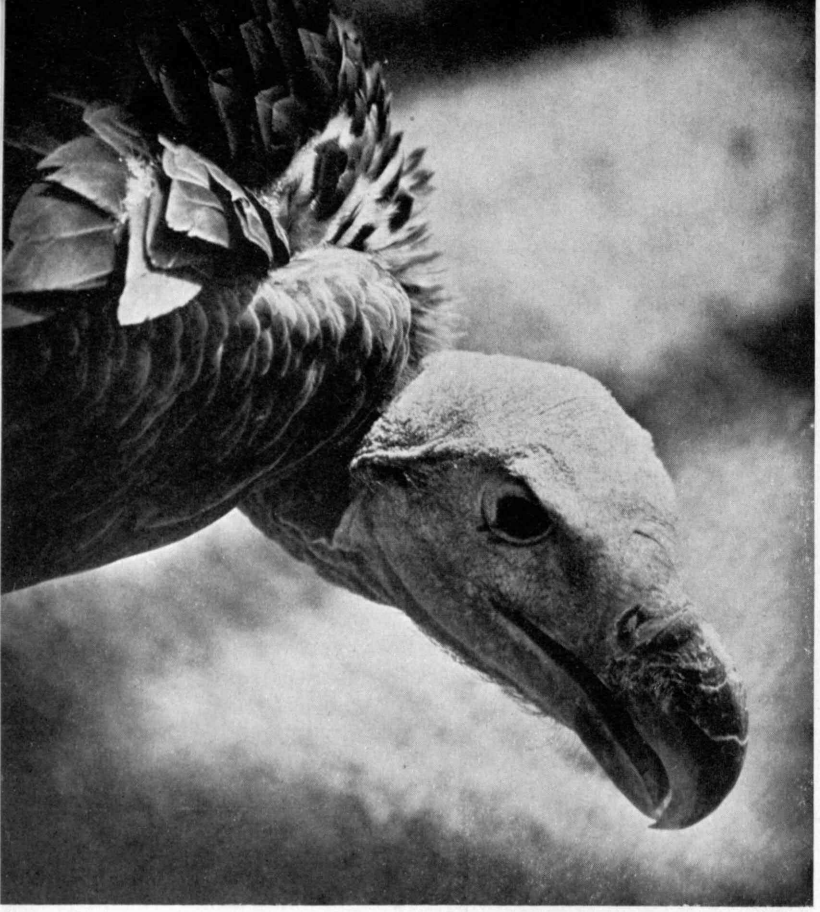
In mid-November, the comet passed sixty-five million miles above that point in space vacated by the earth on October 1. At present it is dipping rapidly downward to pass almost exactly between the earth and the sun on January 19, when it will be sixty million miles from the earth, thirty million from the sun. This distance represents the comet's closest approach to them. Immediately thereafter, it starts its return journey toward the outer reaches of the solar system and beyond, during which it will be visible only to viewers in Southern latitudes, but only before sunrise and only until the end of the year.

If all goes well, Comet Cunningham will be back in the earth's vicinity sometime after the year 4,000. The comet's last



Victor de Palma from Black Star

Chaos — scrap awaiting ultimate re-use



John H. Gerard

A South American vulture in the St. Louis Zoo

appearance was probably about the time Archimedes was crying "Eureka." These two predictions verge on guesswork, but there is a fair chance they will be verified before the comet disappears from view.

No show is perfect. Although this one is going to be great while it lasts, it is not going to last quite long enough. The comet will not be visible when it is at its brightest and its tail is longest. These phenomena occur together when a comet reaches its closest approach to the sun, its perihelion passage. Cunningham's comet at perihelion passage on January 19 will be almost on the line joining the earth to the sun. Its tail, could it be seen then, would lie end on, as it trails back from the comet's head toward the earth. So the curtain will fall about January 6 as far as Northern Hemisphere observers are concerned.

Before the age of science, comets were awesome affairs, as the records of history show. Their very unpredictability and uniqueness of appearance clothed them in vestments of mystery and supernaturalism. When, beginning in 1750, astronomy began to write its version of the cometary story, comets ceased to be mystic auguries of war, of famine, of pestilence, and of other ills. Anything shown to be amenable to the dictates of natural laws loses its supernatural reputation.

The first discovery was that, like planets, comets were members of the sun's family; that they, too, moved in elliptical orbits about the sun, though taking hundreds, even thousands, of years to complete the journey. Further study has revealed the internal character of a comet. The head has been pictured as a transparent sphere of highly rarefied gas impregnated with small, solid particles. Here the adjective "small" covers a range of sizes from large boulders to specks no bigger than dust. While a comet may be a hundred thousand miles in diameter, larger than the largest planet, the amount of solid material it contains is less than that composing the smallest planet. By human standards, however, the amount is enormous.

The relation, other than gravitational, between a comet and the sun has been but partially resolved. Unquestionably, the light of a comet is in part reflected sunlight and in part a sunlight-impelled self-luminosity of the gaseous material. Clear also is the fact that sunlight, by causing disintegration of the solid material and exerting pressure upon the resulting debris as well as upon the other smallest ingredients of the head, motivates the formation of the horn-shaped tail. Since the magnitude of the effects depends on the intensity of the sun's light, maximum brightness and maximum length of tail usually occur at the comet's perihelion passage.

The story of comets from the scientific angle is far from finished. Like laymen, astronomers take bright comets to their hearts. Faint comets occur in abundance, but bright ones are usually once-or-twice-in-a-lifetime affairs and, as is true of other *rarae aves*, deserve attention.

The Widening Eye

BY reason of a truly superhuman versatility, which permits it to gaze unblinkingly into a furnace, react to radiations lying far beyond both ends of the visible spectrum, imperturbably note every detail of a scene in 1/100,000 second, and then produce a record of the event which can easily outlast the men who view it, the camera is used in virtually every field of science and industry. At the first International Exhibit of Scientific and Applied Photography, held in 1937, were photographs, for example, of medical subjects, national disasters, ancient documents, the aurora borealis, and the interior of gun forgings; pictures made with gamma rays, x-rays, ultraviolet rays, infrared rays, and the various colors of the visible spectrum; others made with the aid of microscopes, telescopes, spectrographs, and oscilloscopes. According to the sales statistics, commercial and professional uses (including, of course, many which are nontechnical) require twenty-five to thirty million dollars' worth of photographic supplies and equipment a year, which is less than the amount amateurs consume but more than the amount the moving-picture industry spends.

As C. E. Kenneth Mees pointed out recently at a meeting of the Optical Society of America, some notable improvements have occurred in the past fifteen years to extend the art of photography. Surveying the entire field, Dr. Mees was particularly impressed with the rise of amateur cinematography, the increase in the number of persons doing their own developing and printing, and the recent achievements in color photography.

Changes of importance to the utilitarian applications of the still camera include the creation of many new sensitizing dyes for film emulsions, the rise of small, precision-built cameras with fast and highly corrected lenses, the marketing of photoelectric exposure meters, and the production of many new light sources of increased performance and convenience.

Hundreds of dyes are now available which will increase the sensitivity of film emulsions to one or another color ranging from violet far into the infrared

spectrum. In the latter region, for example, the di-, tri-, and tetracarbocyanines permit emulsions to react to wavelengths up to, and beyond, 11,000 angstrom units (the visible spectrum extends from 4,000 angstrom units in the violet to 7,000 in the red). While the infrared region is as yet of significance mainly to special fields like spectroscopy, all photography has benefited from the fact that there are now available many fast, fine-grained emulsions sensitive to colors according to their relative brightness as seen by the eye. The characteristic of fine grain combined with considerable speed — made possible by the ability of certain of the dyes to increase speed as well as color sensitivity and to affect fine-grained emulsions proportionally more than they affect inherently faster coarse-grained types — is a contributing factor in the rise of miniature cameras, for their tiny negatives must be enlarged many times in order to give prints of normal size.

If the new panchromatic and color films represent a remedy for one of the camera's deficiencies (its former blindness to color), the lenses of wide aperture now found on miniatures and the more powerful light sources are at least palliatives for another — its relative insensitivity to low levels of illumination. One manufacturer offers eight varieties of photoflash lamps and seventeen lamps for color photography; there are also, of course, the single-flash lamps developed as part of the stroboscopic technique. The miniature camera in combination with the single-flash lamp is becoming virtually a routine tool in the study of rapidly moving machine parts and other transient phenomena. At least two forms of single-flash lamps operating for about 1/30,000 second a flash are now offered commercially, and several stock emulsions especially adapted to the spectra of such lamps have been made available.

Not to be overlooked in the development of these devices and in their technical applications is the influence of the great amateur market, sharing development costs and stimulating the evolution of simpler and more reliable techniques for the man behind the view finder. Many an application has grown out of a technician's interest in photography as a hobby, and the transition is the less difficult because much amateur equipment is now easily good enough for the demands of the laboratory.

Bombs That Blaze

PEACETIME living has taught humanity that nothing can be more devastating than a sweeping conflagration. It is only natural, therefore, that men should constantly make use of fire in devising more efficient weapons with which to destroy their fellow men. A discovery of the World War was the flame thrower. A discovery of the current war has been the apparently effective incendiary bomb. Although two types of incendiary bombs were used during the last war, each failed of its purpose because the principal ignitable material burned itself out too rapidly. In one, thermite was the incendiary material; in the other, some flammable liquid, such as gasoline, was used. Incendiary bombs developed for use in the present war are again of two types and are known popularly as electron bombs and multiple-effect bombs.

The electron bomb consists of a shell of electron metal (80 per cent magnesium and 20 per cent hardening metal), inside which is a charge of thermite. Unlike the former thermite bombs, however, in the electron bomb the magnesium shell and not the thermite is the principal incendiary material. Upon impact, the thermite is ignited by mechanical means and burns at a temperature of about 3,000 degrees centigrade for fifty seconds or more, by the end of which time the magnesium shell has been ignited. The shell then burns for ten or fifteen minutes at a temperature of approximately 1,500 degrees centigrade. With the exception of the igniter and the tail, which is made of sheet iron, the bomb is composed entirely of incendiary materials, and hence is more efficient than explosive and other kinds of bombs.

Electron bombs range in weight from one kilogram to twenty-five kilograms. The penetrating power of the lightest of these bombs, however, is not very great, and since they cannot be dropped with any degree of accuracy, they are used for indiscriminate bombing. Such small bombs will pierce only four inches of reinforced concrete, six inches of sand or earth, or a quarter of an inch of steel plate. Because they are awkwardly streamlined, they reach a maximum velocity of approximately 350 feet a second after they have dropped about 5,000 feet. They are not dropped singly but in lots of ten or twenty from containers within the bombing plane. The contents of more than one container can be released simultaneously. Ten or twenty bombs let loose at the same instant from a height of a mile or more will strike anywhere within an area of 10,000 square yards. Heavy electron bombs, on the other hand, are used against specific objectives, such as power plants, munition dumps, and factories. To increase power and accuracy, heavy electron bombs are fitted with steel noses.

A zone-tailed lizard, American Museum of Natural History

American Museum of Natural History

Though a single bombing plane can carry as many as 2,000 one-kilogram bombs, 2,000 fires will not necessarily be ignited. It has been estimated that only 15 per cent of an urban area is built over. If, therefore, 2,000 bombs are dropped, an average of 300 will strike the roofs of buildings. Of these 300, 50 per cent will either glance from the roofs or fail to penetrate because of the roof construction. The remaining 150 can set fires.

Although the electron bomb itself is difficult to extinguish, several methods have been discovered to combat it and to stop the spread of its fire: One is the use of a fine spray of water. Although water accelerates the burning of magnesium, the mere fact that the burning is increased also means that the bomb will burn itself out within two or three rather than within ten or fifteen minutes. The fine spray also serves to wet down the area surrounding the bomb, so that the fire will not spread. Powdered talc, dry sand, or other such granular materials can likewise be used to combat the electron bomb by smothering it. The bomb cannot be smothered while the thermite charge is burning, however, because the oxygen required for the reaction comes not from the outside atmosphere but from the iron oxide of the thermite. To smother the electron bomb, there has also been developed in England a device called a "snuffer," made of wire mesh sprayed and covered with asbestos. Ordinarily, a minute is required to smother such a bomb.

The multiple-effect bomb contains separate incendiary units which scatter over a wide area upon impact. These units are either magnesium, phosphorus, or both. Those of magnesium are combated as are electron bombs, and the units of phosphorus can be prevented from burning by being placed in water. Multiple-effect bombs weigh approximately twelve kilograms and are used in the bombardment of specific objectives.

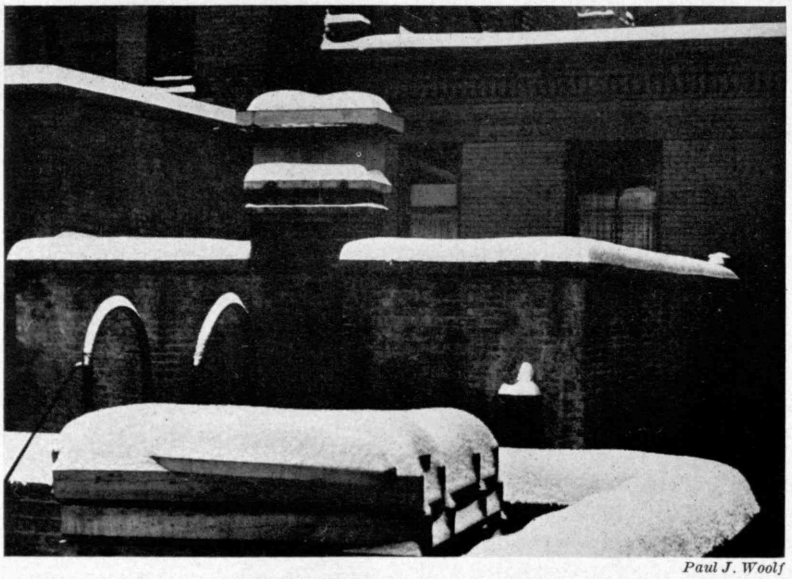
Deep-Sea Oil

IT seems difficult to find a dull book about whales. They are creatures of such miraculous metabolism and such fantastic proportions that a mere listing of zoological data takes on an *Arabian Nights* flavor. The midget whale, for example, is so called because it grows to a paltry maximum of 20 feet; on the other hand, a really big whale, like the blue variety, may exceed 100 feet in length and 150 tons in weight, the equivalent in living tissue of perhaps two thousand men. To approach sexual maturity and about 75 feet in length, as they do in less than two-and-a-half years of adolescence, young blue whales grow (during their suckling period) at an *average* rate of 220 pounds a day. With meat, bones, blubber, and organs containing oil, these mammals are small-scale oil wells; one blue whale weighing 122 metric tons yielded 27.7 tons of oil.

In *Whale Oil: An Economic Analysis*,* the author, Karl Brandt, quite logically introduces such biological data because they are, in the end, the factors which limit the importance of the whaling industry. The baleen whales of the Antarctic, which are the backbone of the industry, must leave the icy seas, where food is plentiful and where they grow fat, and migrate into warmer waters in order to bear their young, which could not at first survive near the ice pack. This annual migration must be respected by the whalemen if whales are not to be destroyed with little return in oil. The fact that the baleen whales are monogamous and appear to show a tribal adherence to certain areas restricts the catch that can be taken year after year from a given region. "It seems beyond doubt," says Brandt, "that the world's stock of blue whales [the largest and most desirable species] has in recent years been overtaxed," a not surprising conclusion in the light of the unparalleled numbers of animals which the modern whalers are taking (see The Review for last June, page 316).

The fear that the whalers are killing a goose laying golden eggs has long haunted the whaling companies as well as their governments. Brandt feels that international agreements and national legislation aimed at controlling the whale fisheries, while definitely a net gain, have been at bottom unsuccessful, mainly, it is true, for reasons beyond control, with the world situation as it has been for the past decade. The only way, he believes, to guarantee the existence of herds large enough to support an industry approaching the present one in size is to limit the total seasonal catch. He cites the encouraging results of that method on the United States–Canadian halibut fisheries and on the herds of fur seals on the Pribilof and Commander islands. [It is to be regretted that the latter illustration may soon be obsolete. Japan several months ago denounced the treaty in which it had been associated with Russia, Great Britain, and the United States for the protection of fur-bearing seals. — Ed.]

In its basic features, modern whaling clearly shows its descent from Nineteenth Century whaling. The new fleets still hunt in the open sea, a flock of (*Continued on page 133*)



Paul J. Woolf

The angularities of urban winter

* Stanford University Press, 1940. xii, 264 pages, $3.00.

Defense and Technology

Specific Problems for Technological Institutions Are Posed as the Nation Proceeds with Its Preparedness Effort

By Bernard Brodie

HOW can our colleges in general, and our technological institutions in particular, aid the national community in the collective enterprise now before it — that of best and most quickly preparing our defense? To what problems of defense ought our faculties to devote their minds and their research facilities? What is it important that our young graduates know? What, in other words, is the role of the student, the scholar, and the research scientist in promoting this essential aspect of the public welfare? Should they be "conscripted" into such a collective endeavor at the cost of disrupting the continuity of their usual pursuits and of violating our justly cherished tradition of academic freedom, which includes freedom to pursue scientific interests untrammeled by official dictate?

Successful resistance to totalitarian aggression requires, if not totalitarian defense, at least defense on a scale far larger than we have yet brought ourselves to understand. The magnitude of our resources and our relative geographical isolation render extremist measures unnecessary — these, indeed, would defeat our purpose [1, *] — but we cannot depend too much on either of those factors. Complacent reliance on our potential strength is potentially disastrous. And we must dismiss all notions of complete "business as usual." A measure of defense preparations designed only to take up the slack in our industrial productivity will surely not suffice.

The issue of whether our research talent ought to be conscripted for the necessary investigations can be dismissed as purely academic. Great Britain, after more than a year of war, has in this respect encountered no difficulties: With a well-organized and constantly developing system of intellectual co-ordination, in which problems are turned over by a Scientific Advisory Committee to those regarded as most competent to deal with them, the question of compulsion simply does not arise. In our country, faced by the possibility but not the actuality of war, the impelling necessity is not so conspicuous. But our scientists will not remain insensible to the public need, once that need is clear. Similarly, we need waste little concern about disrupting pursuits of more enduring interest than current war. With war as endemic to present society as disease is to our physical beings, it is time that scientists, particularly political scientists, ceased contenting themselves with the periphery of the subject and examined the subject itself. Our political scientists have approached the problem of war with the technique of the medicine man rather than of the physician and have sought to prescribe cures without troubling to study the disease.

The program for our preparedness effort involves the utilization of talent in all scientific disciplines. Our whole industrial and economic order must be scrutinized anew with an eye to the needs of defense. The psychological preparation of the population for the tasks before it and the attacks likely to be made upon it must be examined. The strategy of national defense should be studied not only by the handful of military and naval officers to whom it is at present solely entrusted but by all the civilian competence that can be marshaled to the task.[2] The place of Great Britain and other potential allies in our welfare must be resolutely established. Above all, the conciliation of democratic processes with the exigencies of defense preparation and even the conduct of war must be achieved. The proposition that to combat fascism effectively we must surrender our democratic liberties and therefore become largely fascist ourselves is, of course, intellectually crass and untenable, but the existence of a great problem of transcendent importance is thereby indicated.

From this broad point of view it is clear that the technological colleges are not the only institutions of learning with a task to fulfill in the current program. But no one can seriously contend that the role of technology is secondary. Despite the indisputable effectiveness of the nonmilitary weapons of the dictators, the decisions of today that affect man's destiny are those reached on the battlefield. This destiny the technologist influences by providing, or at least offering, new weapons by which decisions may be won, just as he has influenced man's destiny during more tranquil times by transforming the physical basis of civilization. The role of the technological institution in the present crisis is thus primarily the promotion of the study of present methods and possible new means of waging war.

The term "defense" has been used several times in the foregoing paragraphs in the euphemistic sense customary in English-speaking countries, that is, to denote ability to wage war. That it is better to wage war offensively than to have to remain on the defensive may be platitudinous, but considering the tenor of much of our political and public debate, insistence on the point is still necessary. If this country should unfortunately be forced to take to arms, our objective should be not merely to win the war but to win it with the minimum expenditure of blood and strength — to win it in the shortest possible time by means of an overwhelming offensive. Such an end would be sparing of our enemies as well as of ourselves and thus all the more to be desired. Our plan should therefore be not to hold our own in a war of attrition but to attain at the earliest possible moment a decisive superiority.

* Numbers refer to bibliography at the end of the article.

Superiority is achieved in many ways — through greater shrewdness in tactics and strategy, through superior morale, through greater quantity and superior quality of men and weapons. The technologist is concerned primarily with the last of these items — the quality of the weapons.

As Major Victor Lefebure has pointed out,[3] one of the significant differences between the Nineteenth Century and the Twentieth Century in the preparation for, and the conduct of, war is the rigorous secrecy imposed upon the development of new weapons in our time. The degree to which concealment was neglected during the Nineteenth Century frequently reached what to the present-day mind seems almost comic-opera proportions. John Ericson once wrote a letter to the London weekly, *Engineer*, in which he asserted, in indignant protest against an allegation to the contrary, that the *Monitor* had been constructed under the most open circumstances possible, that it had been built in a shed to which anyone who wished had been admitted. We may presume that anyone wearing the uniform of the Confederate armed forces would have been detained at the entrance, but the implication of the letter was that all others were received with the greatest courtesy.

Not merely was there a complete absence of concealment during the Nineteenth Century but the private armament firms were privileged, and even encouraged, to peddle their latest wares on an international market or to distribute to factories abroad on a royalty basis the process of fabrication and the right to manufacture some possibly revolutionary weapon. Thus, the Krupp new process armor, which at the time of its appearance in 1895 completely changed the ballistic standard, was by 1898 being applied to new ship construction in all the navies of the world. Purchases of this armor by the United States Navy were from the Bethlehem and the Carnegie steel companies, which had obtained the process and the license to manufacture the armor. Since the process was a very involved and difficult one, it might easily have been kept secret.

Such absence of secrecy meant that disparity in equipment tended to be one in quantity rather than in quality, and that surprise in the use of new weapons was contingent upon official stupidity of such magnitude as to refuse comprehension of the obvious. For example, the main tactical factor aiding the Prussians to defeat the Austrians so overwhelmingly at Sadowa in 1866 was the needle gun, which had been invented a full thirty-one years before. It had been adopted by the Prussians by 1851 and had been used successfully by them when they had been allied with the Austrians against the Danes in 1864. King William's delight with the gun had been so great during the Danish war that he had ennobled the inventor. The Austrians had had every opportunity to observe its advantages and to adopt it, but they had failed to do so.[4]

In contrast, the rigid secrecy of today in the development of weapons means that a great power, by concentrating its scientific competence on the development of some new type, can very likely assure itself of decisive superiority. In the War of 1914–1918, several new and secret weapons, like poison gas and the tank, might have yielded a quick decision at their first appearance had their full potentialities been recognized by their initiators. Also, the submarine, a pre-War invention whose potentialities were recognized only during the conflict, might in 1915 or 1916 have achieved the decision it failed to win in 1917.[5] To be sure, the resourcefulness of organized espionage must be reckoned with, but by and large the opportunities of surprise in character of armament have steadily grown.

From a detached, objective point of view, this is very unfortunate. It is a factor weighting the scale of international politics toward even greater instability. But as an existing condition it should be considered in our plans for defense. Our aim in rearming should therefore be not to match gun with gun but to match gun with a vastly superior type of gun or with something entirely different and overwhelming in its effects. To provide such is obviously the role of the technologist and of the institution which harbors him.

This idea opens up what to many appears an appalling vista of unrestrained competition among the world's best scientific brains to devise new and ever more horrible instruments of death — truly the lurid end of a civilization that might have set itself to better things. Perhaps so; but war is a phenomenon long since invented and today very much with us. Effort on the part of those menacing us must be matched with effort of our own. Weapons by themselves have not produced war, nor is there any convincing evidence that conflicts have become more bloody with the refinement of the instruments with which battles are waged. When armies had nothing but the highly erratic smooth-bore musket, they obligingly approached nearer each other and remained more exposed during the action than did later armies with their accurate rifles and machine guns. Researches have shown that the naval engagements of the old wooden-walled sailing ships were probably more destructive to personnel in proportion to the number involved than are those encounters which occur under modern conditions.[6]

If nations have become more stubborn in their struggles, if wars of attrition have become more exhaustive, the reasons may be as much sociological as technical — though under "sociological" must be included all the changes in our society resulting from advances in the mechancial arts of peace. But it should not be overlooked that perhaps never before has a great army been so decisively destroyed as an effective military force with as proportionately small a loss of life on the part both of the vanquished and of the conqueror as the French army in the spring of 1940. Whatever conduces to a quick decision may be held to save life. On the other hand, it must be admitted that it may also make war more likely.

The whole question does bring up the traditional reluctance of the military profession to be killed by anything but traditional weapons. The first submarines used against enemy warships during the Napoleonic Wars and the War of 1812 elicited the universal execration of naval men, who, as Admiral David D. Porter later put it, "preferred the more chivalric method of sinking vessels with eighteen and twenty-four pounders, or mowing down their crews with grape and canister." When a civilization deems a weapon dishonorable, no

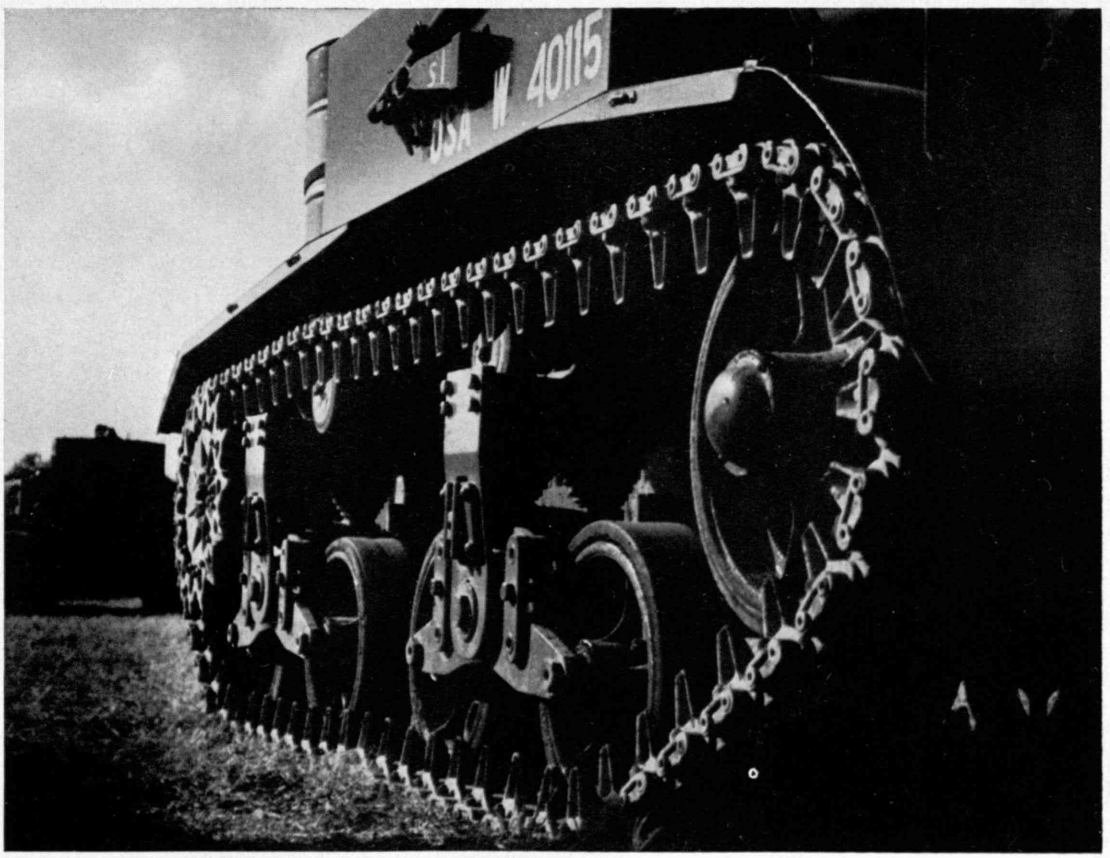
amount of ratiocination to prove the illogicality of the attitude in the light of the existence of war can overcome revulsion at the use of that weapon. Yet the world becomes inured to new methods of inflicting death or injury with surprising and perhaps tragic rapidity. If researches reveal new and apparently heinous methods of winning a decision in war, the appraisal of their advantages in the light of their supposed hideousness will require a good deal of intelligence and the weighing of many issues, including the necessity for living with the enemy after the war. Such researches cannot, however, await our resolution of that problem, for we cannot decide whether to use or avoid a new agent of war until we have discovered it and tested its properties. This kind of research and experimentation is what our institutes of technology are pre-eminently fitted to carry on.

A survey of the catalogues of the leading schools of engineering in the country strikingly reveals the paucity of courses devoted to the engineering of the implements of war. Except for a number of courses at M.I.T. and one or two at Stanford University, advanced courses specialized to this field are lacking, since those of the Reserve Officers' Training Corps departments are usually descriptive and elementary. Courses in "explosives" are offered in two or three chemical engineering departments, but the extent to which the courses are occupied with explosives of military utility is not clear. Of course, the admirably thorough training given in departments of mechanical, civil, chemical, and metallurgical engineering, and particularly in more specialized derivative fields like aeronautical engineering, imparts to young specialists a body of learning and a fund of techniques indispensable to war engineering and of immediate transfer value to it. The scientific and engineering training offered in this country is in quality and availability unsurpassed or even unmatched in any other country — a factor of no mean weight in the determination of our war potential. But as long as there is a lack of courses as specialized to war engineering as are "boiler design," "masonry structures," and "plumbing design" to their respective fields, the burden of research and development in war material will fall upon the few graduate engineers in armament industries and the small group of military officers who have the requisite technological training. Most of them are apt to be promptly burdened with specific tasks which obstruct a broad research outlook.

Why are courses in interior and exterior ballistics, armor-plate engineering, ordnance design, propellants, and chemical warfare so rarely offered in these institutions? The requirements of secrecy always obtrude themselves upon the conduct of such research. But, though the Army and Navy are already co-operating closely with at least several university chemistry departments, the great fund of specialized knowledge in war engineering which is already generalized internationally is not now accessible to the engineering student. The explanation is not in the hitherto small industrial demand for workers in specialized fields, for we find whole departments devoted to the study of such subjects as seismology and astrophysics. The reason doubtless springs from a sense of moral values, from a conviction that institutions of learning should exist to increase man's knowledge of his world and to develop and impart techniques designed to improve and multiply the means for a better life — not to destroy them and life itself.

This conviction is an old one among scientists. Niccolò Tartaglia, founder of the science of ballistics, kept to himself the results of his experiments in 1531 because he had decided that "it was a thing blameworthy, shameful and barbarous, worthy of severe punishment before God and man, to wish to bring to perfection an art damageable to one's neighbor and destructive to the human race," and that to concern oneself with such matters was a "grave sin and shipwreck of the soul." When an invasion of Italy by the Turks became imminent, however, Tartaglia changed his mind. "Today . . . ," he wrote, "in the sight of the ferocious wolf preparing to set on our flock, and of our pastors united for the common defence, it does not seem to me any longer proper to hold these things hid, and I have resolved to publish them . . . so that all should be in better state either to attack the common enemy or to defend themselves against him."[7] The

R. I. Boynton from F.P.G.



Legs of the cavalry — an army tank tractor

antipathy of scientists to the "prostitution" of their efforts in the further development of war instruments does credit to their humanitarian sentiments, but it is bound to collapse under the realization that "destruction" engineering may become really "conservation" engineering in its most meaningful sense — engineering calculated to produce those weapons by which the things we hold most dear in our civilization and in our national existence may be defended against attack.

Engineers, being for the most part conspicuously practical men, have tended always to realize somewhat more clearly than others that a gun is a gun, an inanimate object with no moral status, a material thing which can be used for a purpose, and that it is the purpose and not the thing which should be subject to ethical appraisal. Yet institutions of technology either have not shared this detached view sufficiently to incorporate studies of war matériel into their curricula or have bowed to a pacifist public opinion. When, for example, Sir John Siddeley, a well-known airplane manufacturer, contributed to Cambridge in 1935 the sum of £10,000 for aeronautical research, considerable controversy was provoked as to whether this was a contribution to war research; the authorities were constrained to deny that it was.[8] At this time, it must be remembered, no such controversies were arising in Germany. Pacifist feeling would be very good indeed if it could exist on the same high level throughout the world. Experience has shown that once the war crisis comes, scientists are the first to insist that their ingenuity and organization be utilized by the government in the national effort. The character of totalitarian war, however, necessitates an earlier change of heart among the scientific men of a country that is determined to resist aggression.

The curricula of our technological institutions have rightly undertaken to offer training in industrial management. The successful co-ordination of individual engineering effort is the essence of modern production. But the catalogues give no indication that attention has been paid to those problems which arise in production and management when the nation's economy must be geared to war rather than to peace. In war, the need is for the maximum production of a necessary commodity by all the industrial establishments suited for its manufacture. In time of peace, the individual entrepreneur's interest in the quantity of production is for that level which maximizes his aggregate profit. His efforts are bent always toward increasing that total profit rather than toward stretching his production to the uttermost. Competition under these circumstances tends to result, *in the long run*, in enhancing the efficiency of the individual factory as well as the quality of the product, but it also results in a great deal of waste through failure to utilize available resources wherever "unprofitable" — i.e., wherever the aggregate profit is diminished — and through excessive efforts to stimulate consumer demand, both of which are inimical to a war effort.

The technological colleges should, therefore, encourage investigation of, and training in, problems peculiar to the science of defense economy, a science which has already seen intensive development in Nazi Germany but which has been until very recently practically virgin ground to American economists. The Nazi regime inaugurated a professorship of defense economics at Berlin University as early as the spring of 1934, and since that time the German literature in the field has become enormous,[9] a fact to which several acute observers attach considerable importance in explaining the great German military strength of today.[10] Our purpose in stimulating similar study here would be not to emulate Nazi economy but to learn how best to adapt a capitalistic economy to various national emergencies without sacrificing either its enduring values or the possibility of reinstating it upon the return of more tranquil times.

A survey of curricula brings up another matter of some concern: Many, if not most, of the graduates of technological schools have acquired commissions in the Officers' Reserve Corps as a result of their R.O.T.C. training while in college. These men perforce enter into the cadres in that branch of the service represented by the particular R.O.T.C. unit at their college rather than in the one for which their training most suits them; in the event of a national emergency they would be called instantly into military service and away from those industrial pursuits where they would be of eminently greater value to the country. Not the least of the tragedies in France might then be repeated. In September, 1939, highly skilled workers were mobilized out of the French armament factories and sent to provincial barracks where the men were kept in semi-idleness; weeks and months were required to locate the workers again and send them back to the factories.[11] Even if that situation should not occur here, the fact that commissions are held by many men who are not really available for military service gives us a fallacious picture of our reserve-officer strength, and in the event of mobilization serious dislocation is likely to result. Civil engineers would be valuable in the Corps of Engineers, and some electrical engineers would be needed in the Signal Corps, but that chemical, mechanical, and aeronautical engineers should hold commissions leading them to assignment to 75-millimeter field guns is, to say the least, uneconomical.

On the other hand, though the wisdom of permitting engineers to hold commissions subjecting them to mobilization into nonspecialized services is questionable, their college military training should not be discontinued. It ought even to be intensified, and for the same reason, though in reverse, for which Major General J. F. C. Fuller of England would have his generals study mechanics: "A staff officer graduate . . . ," Fuller says, "must study modern engineering journals, and the old prints of hundreds of years ago depicting flamenwerfers and gas bombs; these will set vibrating brain-waves which will awaken new designs. He must study the evolution of weapons — in fact, he must become an adept in war tool biology. This is scientific preparation for war, the rest is one per cent."[12] The fact is, there is a good deal more substance to be vibrated on this subject in the mind of the engineer than in that of the general. Let the latter's mind be vibrated by contemplation of the instruments which the engineer produces so that the general (*Concluded on page 123*)

Newspaper Engineering

Demands of Readers for Speed and Accuracy Present Tasks Calling for Wide Range of Techniques; Thus a New Specialist Is Developing

By George E. Donnelly

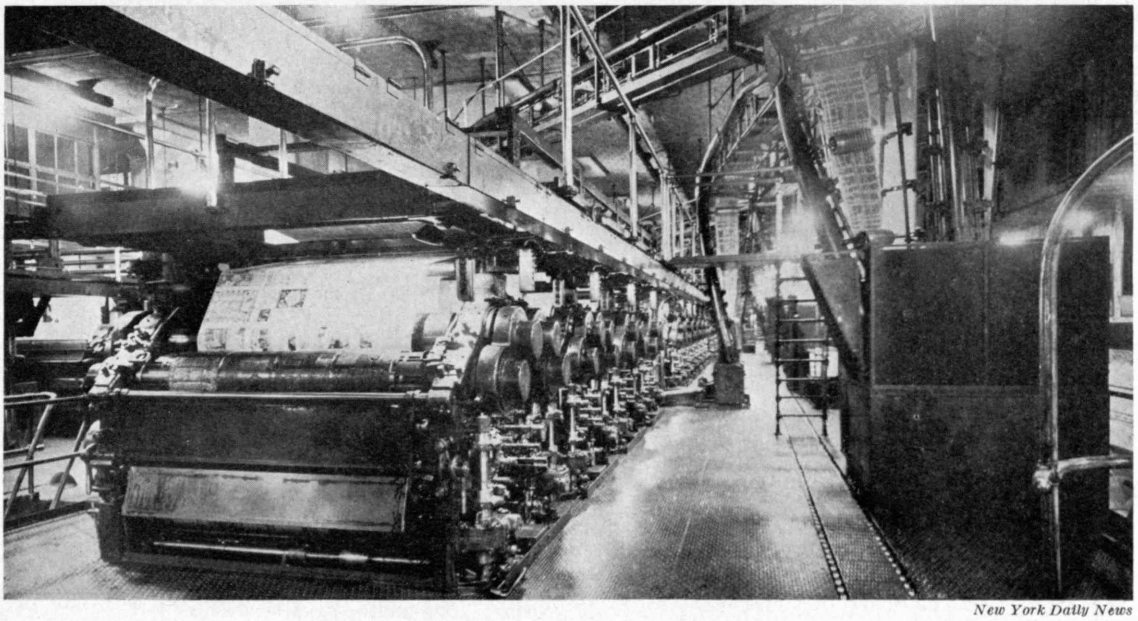
MOTION pictures and short stories have so glamourized the newspapers that scenes of reporters, city desks, and teletypewriters are familiar to everyone. But both the magic of the screen and the license of fiction have passed over the actual mechanical production of the newspaper. The movies show the hero rushing into the editorial room, punching out a story, hurrying it to the editor — then the scene fades. Next, the newsboy on the corner is shouting "Extra," and the front-page headlines are featuring the story.

Unrecorded, there has occurred between these two scenes one of the most fascinating and challenging manufacturing production tasks in modern industry, performed in more than a thousand newspaper printing plants all over the country every day.

With Gutenberg's invention of printing from movable type five hundred years ago, the first step toward the rapid duplication of original manuscripts had been made. Inventions which followed have made possible an ever increasing speed of printing. In the 1700's, the development of stereotyping permitted the simultaneous use of printing plates cast in plaster-of-Paris molds made from a single original assembly of type. The introduction of the half-tone engraving process in the latter part of the Nineteenth Century made possible the use of pictures in newspaper printing. About 1850, the cylinder press was invented, and when curved stereotype plates were adapted to the rotary press, the beginnings of present high-speed printing had taken form. One other step which contributed to the rapid preparation of material for printing was the invention of the mechanical typesetting machine around 1880.

The art of high-speed printing has reached its most advanced state in the modern newspaper plant. Competition of radio and magazines has not reduced the demand of the public for the daily newspaper. Twenty years ago the total circulation of daily papers was about 28,000,000 copies. Today, in the United States, 40,000,000 copies of English-language newspapers are printed daily. One metropolitan paper has a circulation of 2,000,000 daily, another more than 1,000,000, and several others between 500,000 and 1,000,000. Sunday-morning circulations of 1,000,000 are not uncommon, and one city paper prints 3,800,000 copies. If the sheets of all copies of that Sunday paper were laid end to end, they would form a continuous band about 40,000 miles long.

The selection, maintenance, scheduling, and operation of equipment to produce these papers constitute a challenge to the best of management. The paper *must* be printed. Temporary delays and failures are costly to all industries, but they are almost fatal in newspaper printing. Minutes count, for the man who wants to buy a newspaper will not wait, and a competing paper is always on the newsstand. Time cannot be made up in



A modern newspaper pressroom. Papers are automatically counted and delivered on continuous conveyers to a shipping room. The track on the floor (lower right) is a plate conveyer which carries the stereotype plates from the stereotype room to the presses.

New York Daily News

New York Daily News

Into the page compositors insert lines of type produced in type-casting machines. Photoengravings of pictures are also put into the page at this time. No printing is done directly from type.

newspaper production — an extra shift cannot always be used to print the copies lost in an earlier production failure — because today's news and today's paper are worthless tomorrow.

Though speed is of fundamental importance, it is by no means the only problem. Quality and accuracy are essential. No advertiser, for instance, will pay for a poorly reproduced advertisement. Modern advertising is both a science and an art; specialists employed by the advertiser or his agency spend days preparing copy which is to have a particular effect or appeal. If the desired effect is not secured in the printed result, the printing is not successful. For success, then, pictures must be carefully reproduced, ink must be properly adjusted, and yet speed of production must be attained. Needless to say, nothing in the mechanical preparation of the paper should condone inaccuracies. Errors in advertising or editorial material must not occur, and speed of operations is never an excuse for their occurrence.

The daily printing of 2,000,000 copies by one large newspaper requires a first-class production organization and the very latest and finest mechanical equipment. The plant of this huge metropolitan paper is equipped with an hourly press capacity of more than 700,000 complete, folded papers; news rushed from the editorial room is rolling off the presses in less than twenty minutes.

To the layman, modern newspaper printing presses are miracles of engineering. To watch the continuous webs of paper whip through the printing rollers at 1,600 feet a minute; to see a sheet assembled with others in the proper order; to see it cut, folded, and delivered to the mail rooms without the motion of a single man, except for supervision, is thrilling not only to the layman but to the most experienced engineer as well.

The present method of printing consists of four fundamental operations: Copy is received from the editorial and advertising departments and is reproduced in type by the line-casting machines. Some of the very large elements, such as front-page headlines, are hand set from separate pieces of type. The type is then assembled in the proper page and position by compositors working under the eyes of make-up editors.

Pictures to appear in the paper are sent to the photoengraving department while the type material is at the type-setting machines. The engraving department produces photomechanical halftone engravings. When an engraving is complete, it is sent to the composing room, where it is assembled in its proper position with the type. It is then mounted on a base to bring it to the proper height in relation to the type. The complete page is locked securely in a frame, and the entire form is sent to the stereotype department.

Here, a moist matrix of the page is made, and curved stereotype plates are cast from the dried matrix. The plates are mechanically trimmed and shaved to insure proper thickness and perfect fit to the cylinders of the printing press.

Carried by the rotating cylinders, the plates receive ink from a roller and then transfer the ink to the paper web. The paper is fed continuously to the press from large rolls, weighing almost a ton, mounted on reels beneath the press. A folding unit assembles and folds the paper, counts and delivers the completed newspapers to conveyers which, in turn, carry them to the shipping rooms.

The process appears routine and exact. When viewed by the man not in the profession, it may seem amazing and very nearly perfect. But is it?

The least complicated step in the entire system of newspaper production is the preparation of the stereotype plate. Brief analysis of some of the unknown factors in this simple procedure may indicate how little is actually known today about the mechanical processes used in printing. First, the papier-mâché flong, or unmolded matrix, may be studied. It is composed of cellulose and may be said to resemble a desk blotter. Manufacture of the flong is difficult and exacting, for the material must be free from large fibers or other imperfections which might appear on the face of the matrix and hence on the printing surface of the plate cast from the matrix. The moisture content of the flong is of

fundamental importance and should be carefully controlled in the manufacture. At times, complete shipments must be returned to the producer because they are unsatisfactory. The moisture content must be sufficiently high to permit effective molding without fracture. Excessive moisture makes the flong mushy, and a longer period of drying would be required before the casting operation.

More often, difficulty with the flong is a result of the atmospheric conditions under which it is stored. However well the moisture may have been controlled in the manufacture, unless that same condition is maintained until the time of use, unsatisfactory molding may result. The correct atmospheric conditions have not yet been established and are not in common use by the newspaper plants throughout the country.

In the stereotyping process the assembled page of type and pictures is brushed free of dirt or other pieces of extraneous material, and the moist flexible flong is placed on top of the page. A cork impression blanket one-quarter of an inch thick is placed over the flong, and a thin steel plate is put on top of the cork. The platform on which they are positioned is moved beneath a large roller, clearance under which is less than the overall height of the type, flong, cork molder, and steel plate. Thus, as they are passed beneath the roller, the cork is compressed and exerts pressure on the flong, which molds itself to the shape of the type and pictures. Uniformity of thickness of the matrix thus produced is necessary, for any variation in this dimension will later be reflected in unevenness in surface of the plate to be cast.

The physical characteristics of the cork molder are obviously of great importance. A stiff hard cork will result in excessive pressure on the matrix and will lack the flexibility essential to the proper depth of the molding. A highly compressible cork will cause inadequate pressure and unsatisfactory molding. No two cork molders, as received today, are alike. Each time a cork is changed, an adjustment must be made in the setting of the molding roller. The adjustment is done by the stereotyper, who gauges it by inspection of the molded matrices. No method has yet been devised to test the cork and obtain a setting for the roller. It is now entirely a matter of judgment of the practical man, and the results are not always satisfactory.

Other variables further complicate the molding operation. Repeated use of a cork results in fatigue, so that an original setting must be frequently revised. Of even greater effect is the variation in the make-up of different pages. Obviously, a page composed entirely of the almost flat areas of pictures requires a greater pressure for proper depth of impression in the matrix than does a page made up solely of individual type characters and figures. The adjustment of the roller for the required pressure is important, but under the present operation the sole determining factor is the judgment of the stereotyper. If the resulting matrix appears unsatisfactory, another one may be made with a revised pressure setting, but speed requirements do not always allow this repeated molding.

The matrix is moist and flexible after molding. It must be reinforced and dried to withstand the pressure of molten stereotype metal. As the matrix conforms to the composition of the page which it is to reproduce, the cork molder forces the flong down into those areas between the type which are not to print. Thus, the back of the matrix — the side away from the surface bearing the detail — is not smooth. It is important that those areas depressed from the rear should not be forced back into level position by the pressure of molten stereotype metal during molding. Insurance against such deformation is accomplished by a slow and tedious process — a hand operation called "backing" — which involves the pasting of strips of adhesive cellulose into all the hollow areas on the back of the matrix. This operation is a bottleneck at present. Several men working simultaneously on a single matrix are required to speed the production. Placing the packing in the proper areas demands skilled and experienced stereotypers. No area which might fail under pressure must be missed, and any area which has sufficient strength to obviate the necessity for packing should not be packed. Time is too valuable to be wasted further. (*Continued on page 126*)

Molding the matrix to be used in casting the curved plates from which the newspaper is printed. Note the original type, papier-mâché matrix, flexible cork, and curved pressure roller.

New York Daily News

What's Happened to Television?

Troubles in Video Engineering and How They Are Busying the Remarkable "Committee of 168"

By Donald G. Fink

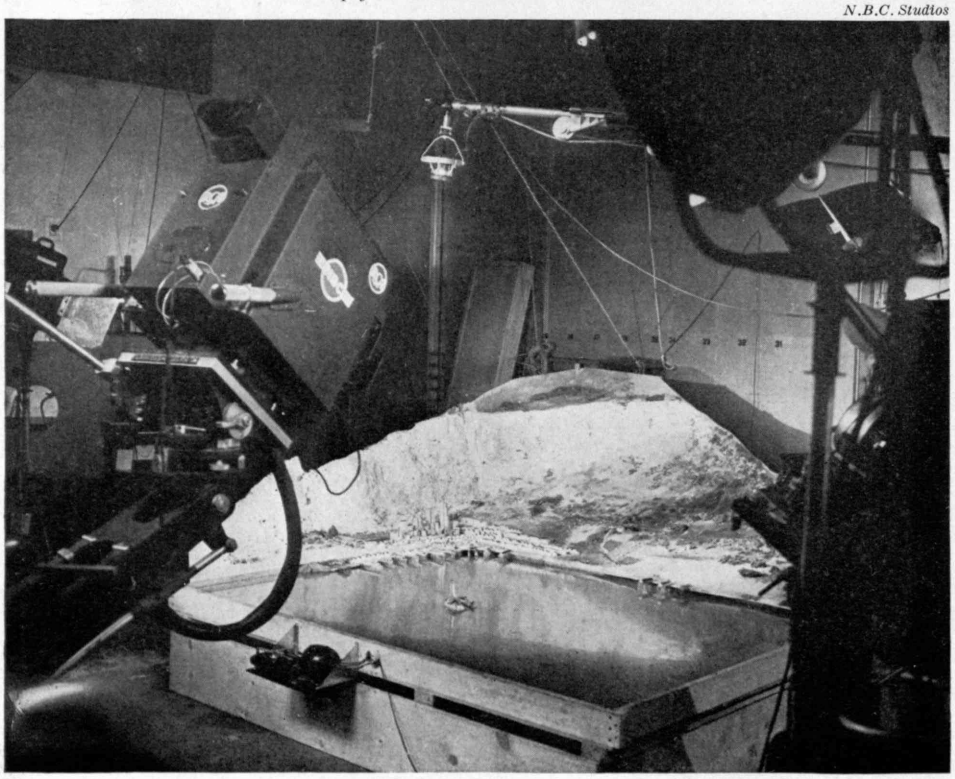
THE classic story about committees relates to Mrs. Charles F. Kettering, who, seeing Lindbergh's plane at the Smithsonian Institution, turned to Mr. Kettering and said, "To think that he did it all alone!" To which remark her experienced husband replied, "It would be a great deal more remarkable, my dear, if he had done it with a committee." Committees are so notoriously cumbersome when called upon to settle controversial issues that the "Lone-Eagle" approach has an almost irresistible appeal. A committee, like a democracy, usually arrives at the best compromise, given time. But when time is an element, the results may be nil.

The story of the National Television System Committee is therefore one of the most remarkable in the recent history of technological standardization. This committee, instituted late in July and organized the following month, is composed of no fewer than 168 members and alternates who in less than four months devoted 3,000 man-hours to committee meetings alone and spent an additional 3,000 man-hours in travel and preparation of reports. The proceedings of the meetings — minutes and supporting documents — run well over a thousand pages. A quarter of a million sheets of paper have been consumed in circulating this material to the members of the committee, at a cost of over $6,000. This accomplishment has been brought to pass by several circumstances: Every man on the committee has a vital interest in the outcome of the deliberations, and so has the company for which he works; the committee was working against a dead line "suggested" by the Federal Communications Commission; and the organization of the committee was very skillfully contrived to avoid wasted time and effort. The result is that all the standards for commercial television broadcasting, excepting a few minor points, have been examined and re-examined; final recommendations, made by a record vote, are ready for presentation to the F.C.C., complete with minority reports. The government agency will hear a progress report from the committee on January 27. Thereafter, barring unforeseen contingencies, the F.C.C. will promulgate the recommended standards as official for the United States, and television will be off again in full stride.

If this hoped-for event takes place before next Easter, television's stride will have faltered for less than a year. For it was on Easter morning, 1940, that the radio industry woke to find on the front pages of the newspapers the startling announcement that the Federal Communications Commission had decided to withdraw its promise of early commercialization of television broadcasting. The reason given by the F.C.C. was that commercial activity in marketing television receivers was in effect establishing a set of television-transmission standards to which the government had not given assent. The standards in question had been formulated over a three-year period, from 1936 to 1939, by a committee of the Radio Manufacturers Association, had been universally adopted by television-receiver manufacturers, and had been proposed for official adoption by the Federal Communications Commission. This step the F.C.C. had declined to take, stating that it neither endorsed nor rejected the proposals since in its opinion the art was in such a rapid state of flux that standardization was premature. The commission nevertheless went ahead with plans to permit television stations to broadcast on a commercial basis, the standards meantime being held in abeyance.

Setup for a television shot in miniature

N.B.C. Studios



This procedure was a mistake, as James L. Fly, chairman of the Federal Communications Commission, admitted later before a Senate investigating committee. With no official standards, the industry was preparing to launch commercial television, free to choose whatever standards it desired. The industry was

in agreement on most of the standards advocated by the Radio Manufacturers Association; hence they were the logical choice. But when activity proceeded along this line, the government realized that the R.M.A. standards were in effect being made official simply by putting into the hands of the public receivers designed for these standards.

Action followed swiftly on this realization. The public was warned against buying receivers, and the industry was publicly chastised for usurpation of a government function. Chairman Fly went on the air on a national network to justify the commission's action. Antiadministration newspapers cried "punitive action," "unwarranted paternalism." The hullabaloo reached such proportions that the Senate summoned Chairman Fly before a committee to explain the commission's action, and even President Roosevelt felt called upon to state to the press that he was sure the matter could be satisfactorily adjusted in a short time.

Seldom is the public treated to such a clear view of the problem of technical standardization, but it is doubtful that the lay reader realized what was behind the stories. Rather, he became confused, sure only that he would put off buying a television receiver until the government and the industry had composed their differences. Sales of television receivers fell almost to the vanishing point. Radio's infant prodigy, barely able to walk, suddenly found itself crippled and no crutch in sight. Budgets for television programs were pared. The owners of television receivers in New York, variously estimated at between 2,000 and 3,000 in number, found the quality and frequency of the programs declining. For two months, while a shift in wavelength was being made, no program service was available in New York at all, and a combined investment of nearly a million dollars in receivers languished. When service was resumed, the number of programs being transmitted had been reduced from fourteen or fifteen hours a week to four or five hours. Clearly something had happened to television.

Those familiar with technical standardization are well aware of the fundamental conflict between the necessity for standards in order to initiate an art and the inhibiting effect which standards have on the future progress of that art. Essentially that is the conflict which "happened" to television. In itself, however, that conflict was not solely to blame. There were also a generous admixture of ordinary misunderstanding of what items in television really require standardization, as well as a few philosophical footnotes introduced by the prevailing thinking of governmental regulatory bodies.

One of these philosophies is the principle enunciated by the Federal Communications Commission, that equipment or apparatus sold to the public should retain its "original degree of usefulness" indefinitely. Thus the crystal sets of twenty years ago are just as good today as ever they were; in fact, they perform better, because broadcast stations have improved in the meantime. According to the principle, the F.C.C. would not knowingly permit standard broadcast stations to change their method of transmission in any way which would lower the utility of the crystal set or any other kind of set sold to the public in good faith. (Parenthetically it should be noted that crystal sets and other standard receivers are not suitable for reception of frequency-modulated, staticless broadcasting scheduled for commercial operation this year, but presumably the standard broadcast stations will remain in operation to serve these receivers until the public has no further use for them.)

The application of the obsolescence-not-permitted principle to television sets is dictated by the fact that a variety of changes in methods of television transmission is conceivable. If adopted, these changes would render existing receivers completely useless. Note that these changes are *conceivable*. Whether they might become *desirable* changes is a moot question. This is one of the questions which the National Television System Committee has been called upon to answer.

The method of sending television pictures, it will be recalled, involves the analysis of the image in the television camera into a series of horizontal lines and the transmission of the information contained in these lines, one after the other, until the whole picture has been covered. The process is repeated rapidly enough so that many pictures may be sent each second. The number of lines required depends on the degree of pictorial detail desired vertically in the reproduction, whereas the number of pictures to be sent each second is determined by the tendency of the pictures to flicker and by the necessity for reproducing motion smoothly. When these specifications have been decided, the detail along each horizontal line is governed by the space in the ether assigned the transmission system. (*Continued on page 129*)

"Patience," the dummy, poses for her teleportrait while an engineer makes measurements of the light reflected from her countenance.

N.B.C. Studios

Man's Relation to the Cosmos

One Must Pay for What One Gets, in Cosmic Dealings as Well as in Other Affairs

By Cecilia Payne-Gaposchkin

THE title of this essay presents a great temptation to an astronomer. To interpret it in a technical sense and to write a discourse on "Recent Advances in Astronomy" would be easy. But astronomer though I am, that is not what I propose to do. The subject that I have chosen is the housing problem: where to live? how to find the means? how to use them to make life possible? how to make life not merely possible but also pleasant? The purpose of this essay is to describe the advantages of living in the cosmos.

There are two parties to every transaction — even to this of living in the cosmos: You, and the cosmos. And two questions to be answered: What has the cosmos to offer me? What have I to offer the cosmos? Do not let the second question surprise you. Engineers, physicists, and chemists are in daily practical contact with one of the fundamental laws of nature. In the dry, legal terminology of science we call it the conservation of energy. When translated into the language of everyday life, it runs: "One has to pay for what one gets." Few of us expect to get something for nothing in a commercial transaction; those few who manage to, do so by imposing on their fellow men. But who ever thought of trying to impose on the cosmos? There are no exceptions to the operations of gravity and centrifugal force. As surely as we have to pay in human currency for the material things we acquire, we must pay in universal currency for the benefits we receive from the cosmos. And the best things come high — so high, indeed, that we cannot afford some of them at present.

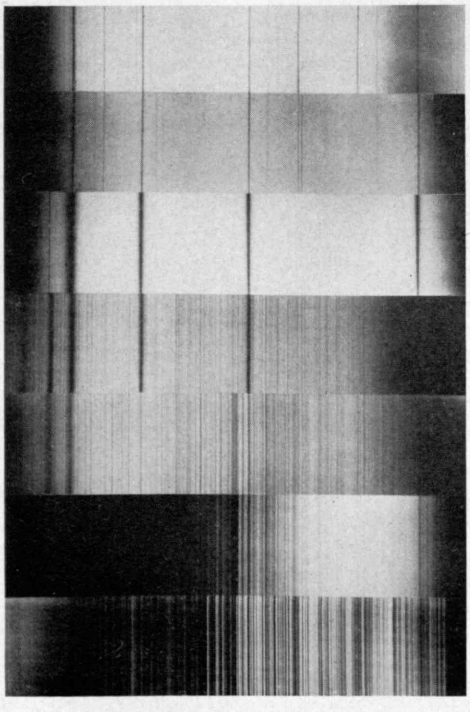
But I am getting ahead of myself. We must examine what the cosmos has to offer to man. First come the raw materials, the atoms — I had almost called them the fundamental units of the cosmos, but we all know better than that nowadays. The generation that called atoms "the unsplittables" knew more Greek than physics. This sort of thing is used today as an argument against classical education but should rather be used as a warning to the science of any day, lest it think that its latest findings are the ultimate truths. Even though the atom has been dissected and redissected, let us take it at its face value. It is lucky for you that I am not a metaphysician. If I were, I should spend the rest of this essay in the attitude of the centipede, who, when she was asked:

> . . . which leg came after which
> . . . . . .
> She lay distracted in a ditch
> Considering how to run.

What does the cosmos offer to us in the way of atoms, of chemical elements for building our homes — and for building ourselves, for that matter? A quantitative analysis of the universe is difficult to make. We can perform spectral analyses only of matter that is radiating or absorbing light in the form of line or band spectra. We really do not know how much "dark" material is in the stellar system, and we know still less about what it is made of. The stars, which are radiating at high temperatures, are easier to analyze. We can make our analyses only of their outer skins, however, thus taking a census of perhaps .000 000 000 01 of the total atomic population. Probably the lighter atoms have a tendency to drift to the upper layers, so that elements like hydrogen and helium are apt to be overrepresented in analyses of the stars.

The spectrum of the well-known naked-eye star, Capella, evidently consists of a number of dark lines crossing a brighter background. The lines look dark, but that appearance is only an effect of contrast. They are no more totally black than a sunspot is. A qualitative analysis of Capella's outer skin is comparatively easy to make. When the wavelengths of the absorption lines have been measured, identification of the atoms that are responsible is easy. In the spectrum of Capella are scarcely any lines that are not known in laboratory spectra. Certainly there are no strong ones. The atoms in the atmosphere of Capella are atoms that occur on the surface of the earth; nothing suggests the presence of other atoms in any great quantities.

The spectrum of the sun is very like the spectrum of Capella; in fact, at first glance you would probably say they are identical. But there are two important differences. First, Capella is twins, whereas the sun is single. Capella's



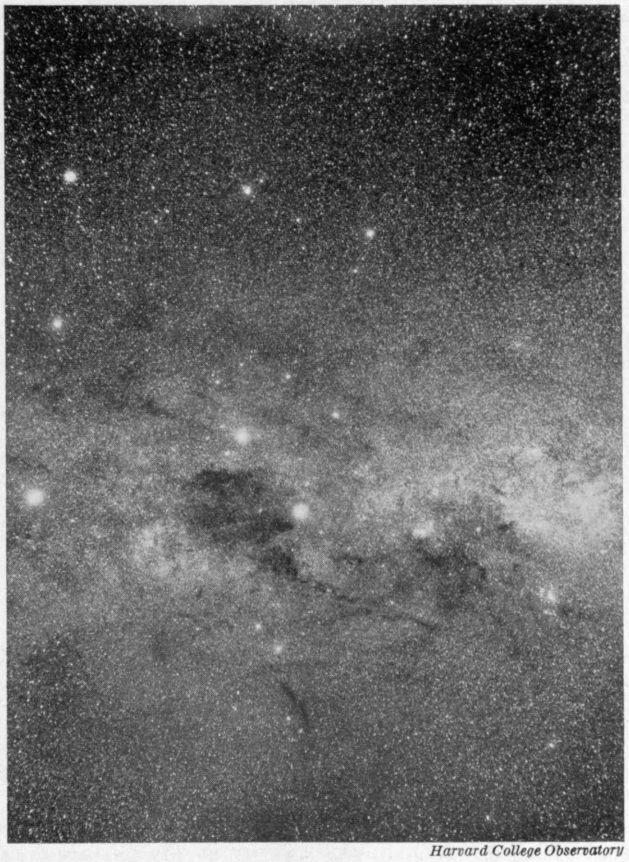
The stellar spectral sequence

duplicity cannot deceive the spectroscope; the lines give it away. Second, the sun is a dwarf, and Capella is a giant thirteen times as large as the sun, heavier, and brighter. You could tell that fact even from their spectra, although it is well established for Capella and the sun in other ways. Two spectral lines, the ultimate lines of neutral calcium and ionized strontium, can be used as a basis for a pretty shrewd guess at the size and brightness of a star, because they are very sensitive to the effect of gravity. When the gravity is low, the line 4215 of ionized strontium is relatively stronger than when the gravity is high. One sees at a glance that it is lower on Capella than on the sun.

In spite of their differences in size and multiplicity, the sun and Capella are found to be identical in chemical composition. A very careful study of the qualitative composition of the sun, carried out with spectra of enormous dispersion, leads to the conclusion that all terrestrially known substances that could possibly give spectral lines, within the region we can study and at the solar temperature, are present on the sun. Qualitatively, the sun and the earth are of identical chemical composition, a fact which is, perhaps, not very surprising if we are right in guessing that the planets were born of the sun.

The quantitative analysis is more tricky. Even if the skin effect is ignored, there remains the difficult problem of deducing the numbers of atoms of a given kind from the strength of their absorption lines. We can readily tell how many atoms are producing a particular line, say, a line in the spectrum of neutral iron. But to deduce from this fact how many atoms of iron are present altogether is a problem of a very different order. The spectrum of neutral iron contains thousands of lines; so do the spectra of once and twice ionized iron. The possibilities obviously are enormous. Moreover, it must not be forgotten that many spectral regions of the stars, notably the ultraviolet, are inaccessible to photography.

The distribution of the atoms among the possible states of ionization and excitation depends on the local temperature and pressure. How much effect these factors can have may be seen from the photograph on the opposite page. The spectra of almost all the stars can be arranged in a continuous sequence. And the upshot of observation and theory concerning the atmospheres of these stars is that they are all of the same composition.



Harvard College Observatory

The Southern Milky Way in Carina and Crux

The differences that are so apparent to the eye are caused by differences of temperature and pressure, principally by the former.

How does this fact concern us? It tells us that the sun and most of the stars are of identical chemical composition. In other words, the cosmos provides us on the earth's surface with a perfectly representative sample of the universe. These are our raw materials. Of these we must build our houses, and ourselves.

Living matter seems to have stuck even more closely to the composition of the cosmos than to that of the earth itself. If you analyze yourself, you will find that you contain relatively more atoms of hydrogen, carbon, nitrogen, and oxygen than the earth does on the average. In building himself, the living creature has used the typical cosmic sample. He is the child of the stars, rather than of the earth. Luckily for us, we are situated near a pretty average star. Some parts of the universe appear to be relatively deficient in carbon. And our civilization is essentially a carbon-compound civilization. Our style would be severely cramped by a shortage of carbon atoms. For carbon we have never found, and shall probably never find, a satisfactory atomic substitute.

WHAT does the cosmos offer in the way of a site? There, indeed, we are lucky. Few building lots are so propitious. Our site, of course, conditions the kind of house we are able to build. We are a little prone to forget to what extent our surroundings dictate our structures.

Imagine yourself for a moment at the surface of Betelgeuse, the gigantic red star in the constellation of Orion. Some day I mean to write a textbook of astronomy and physics for use at the surfaces of supergiant red stars, where there are no solids, no liquids. One could form no macroscopic conception of structure. There would be no geometry, no ideas that depended on form or rigidity. That fact would make very difficult most of our mathematics and all of our classical physics. The so-called new physics would probably be classical physics on Betelgeuse.

But would not astronomy be the same there as here? Far from it. Probably nothing would be observed which could give a clue to the laws of motion and the idea of gravitation, unless, of course, Betelgeuse is blessed with planets. Even the idea of the geometry of the universe would be different from ours. Parallaxes would not be measured from opposite sides (*Continued on page 123*)

THE INSTITUTE GAZETTE

PREPARED IN COLLABORATION WITH THE TECHNOLOGY NEWS SERVICE

Training for Defense

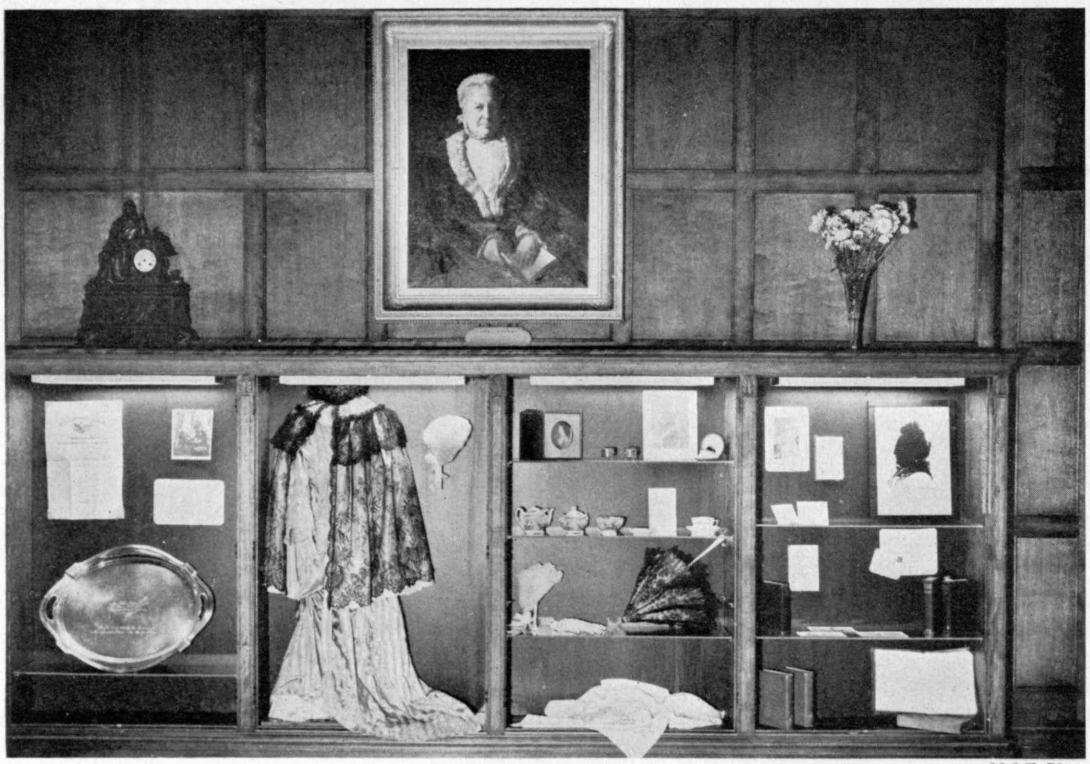
EMERGENCY courses for engineers and technicians urgently needed in the nation's defense industries will be started this month and in February under a co-operative program sponsored by the Institute, Harvard University, Northeastern University, and Tufts College. The proposed program comprises full-time day courses as well as evening courses of college grade for men who are employed. Organized to comply with the engineering defense training program of the United States Office of Education, the courses are part of a nation-wide project supported by the government for specialized training in fields essential to national defense. The courses will be offered if there is sufficient demand to satisfy the requirements of the United States Commissioner of Education and will be given without tuition charge to the students.

The other engineering schools in the northeastern regional district, which includes Maine, New Hampshire, and Vermont as well as Massachusetts, are preparing to offer similar intensive courses. These programs are being planned by the individual colleges, which have the co-operation of the regional adviser on engineering defense training, Edward L. Moreland, '07, Dean of Engineering at the Institute.

The joint program of the four Greater Boston institutions was arranged to avoid duplication of courses and to assure the most effective utilization of the special teaching and laboratory resources of each. The committee in charge of the project, which is expected to train approximately one thousand students, includes Harald M. Westergaard, dean of the Harvard Graduate School of Engineering; Raymond D. Douglass, '31, Professor of Mathematics at M.I.T.; William C. White, dean of the College of Engineering of Northeastern University; and Harry P. Burden, dean of the Tufts Engineering School.

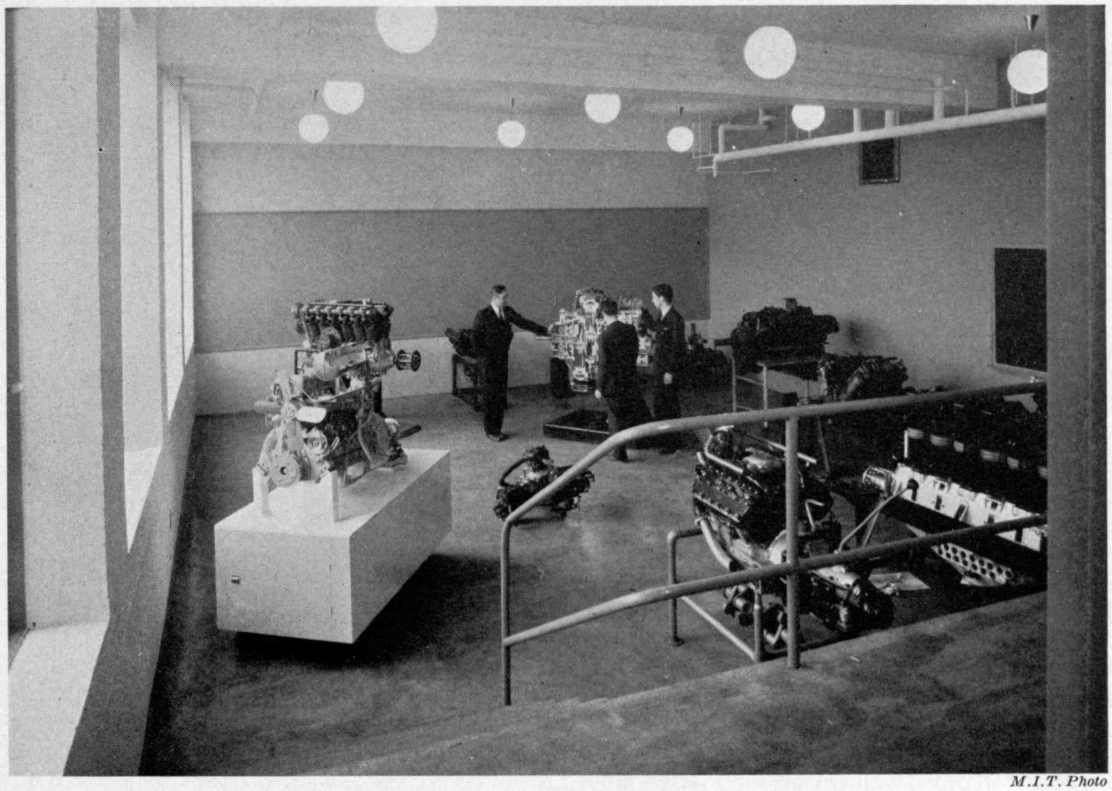
None of the courses conflicts with or replaces regular evening courses now being offered by such agencies as the Massachusetts University Extension Division, the Lincoln Institute of Northeastern University, the Lowell Institute School, or the university extension courses of Tufts College. In general the requirements for admission include at least three years in an accredited engineering school or its equivalent. In some instances two years in an evening engineering school plus practical experience may be considered sufficient preparation, and in certain cases other preparation may be acceptable. Some highly specialized courses will require engineering degrees. Application for detailed information on all courses to be given at the participating colleges in the Boston area should be made immediately by mail to the Engineering Defense Training Bureau, Room 7–102, M.I.T., Cambridge.

The subjects of the full-time day courses, which will be the substantial equivalent of one full college term of sixteen weeks, are expected to include airplane power



M.I.T. Photo

Memorabilia of Emma Savage Rogers, wife of Technology's first President, on exhibition in the room that bears her name. The silver tray, presented to her by the students of 1865–1885, was given to the Institute by her nieces after her death, for use by the wives of Presidents of the Institute.



Engines on display in the exhibition area which is a feature of the recently completed addition to the Sloan Automotive Laboratory . . .

M.I.T. Photo

plants, airplane structures, camp sanitation and water supply, building construction, defense production and co-ordination, naval architecture, marine engineering, meteorology, mapping, topography and surveying, and aerial mapping.

There will also be for nonengineering students a full-time day course on engineering fundamentals. This course offers an opportunity to graduates of arts and science colleges who have fundamental training in science and mathematics to prepare themselves in the general field of engineering for employment in the engineering or production department of industrial concerns engaged in work related to national defense.

The proposed subjects of the evening courses, which will require from two to three hours on two to three days a week for periods ranging from twelve to twenty weeks, include machine design, production engineering and supervision, elementary airplane structures, radio communications, concrete construction and inspection, foremen training, chemistry in national defense, testing and inspection of materials, physical metallurgy, reinforced concrete, and welding engineering. Other evening courses will cover applied mathematics; applications of metallography; exterior ballistics, which is the mathematical treatment of projectiles in flight and requires advanced mathematical preparation; servomechanisms, the study of machines which anticipate and control other machines; vibrations and their applications; and instrumentation, which covers the use of engineering instruments employed in design and manufacture.

If there is sufficient demand, courses in other subjects may be added to the present program, and specialized courses may be established for groups in important industrial centers.

Popular Science Lectures

THE first of the annual series of four popular science lectures sponsored by the Society of Arts at the Institute was given on December 15, when Hoyt C. Hottel, '24, Associate Professor of Fuel Engineering in the Department of Chemical Engineering, discussed "The Sun as a Competitor of Fuels." Professor Hottel is chairman of the Institute's committee studying various uses of solar heat, including winter house heating, summer air conditioning, and power generation.

The second lecture of the series, "Color Photography," will be given by Arthur C. Hardy, '18, Professor of Optics and Photography in the Department of Physics, on Sunday afternoon, January 12. In his lecture Dr. Hardy will demonstrate the development of three-color photography and review the present status of color reproduction.

On February 16 George E. Russell, '00, Professor of Hydraulics in the Department of Civil and Sanitary Engineering, will discuss "Water and Water-Power Development," in a lecture which is to be supplemented by striking hydraulic experiments.

The final lecture of the series, "The Art of Soft-Ground Etching," will be delivered on March 16 by the distinguished etcher, Samuel V. Chamberlain, '18, who is a lecturer on expressions of graphic art in the Institute's School of Architecture.

Dental Clinic

A GRANT of $10,000 by the Charles Hayden Foundation to establish a dental clinic in the Richard Homberg Memorial Infirmary for the benefit of students of the Institute has been announced by President Compton.

The grant, which was conveyed to the Institute by J. Willard Hayden, President of the foundation created by his brother, the late Charles Hayden, '90, will bring to realization a plan long contemplated as part of the Institute's medical service to students. Through the generosity of the Hayden Foundation, Technology some time ago was presented with a 200,000-volt x-ray machine and fluoroscope equipment for general clinical examinations. Space for a dental clinic was provided when the infirmary was built in 1928, and plans are now going forward for installation of the necessary equipment.

The dental clinic for students is a service to reduce the development of physical impairments arising from faulty dental conditions. The clinic will provide for thorough examination and diagnosis as well as emergency treatment, and for advice to students for correction of defects by their own dentists. When the new clinic is established it is expected that dental inspection will become part of the regular annual physical examination required for all students at the Institute.

The addition of a dental clinic will give the Institute one of the most complete medical services for students in any educational institution in the country. The Department of Hygiene is administered by Dr. George W. Morse, medical director, and the staff includes four physicians, who conduct daily clinics, and a group of graduate nurses. Students receive medical or surgical treatment in this clinic without charge. In addition to being responsible for the health of the Institute's three thousand students, the Department of Hygiene provides similar service for the Institute's teaching staff of approximately five hundred and for nearly four hundred employees.

M.I.T. in the Last of the 1870's

BY EDWARD R. WARREN

IN a sense what follows may be considered an account of the Class of '81, my own Class. That is not actually the case, however; this is an account of the instruction and such matters as I recall them. Very little biographical matter is included here.

I entered the Institute in the fall of 1877 after my graduation from the Waltham High School. One other Waltham boy, Thomas Howard Barnes, entered at the same time but did not continue beyond the first year. Our Class was perhaps the largest that had entered for some years. It was large enough to occupy nearly, if not all, the desks in the first-year drawing room, our headquarters for that year. The first-year students were not divided into the different Courses they intended to take; that came the second year. Therefore, we all took the same studies and had the same instructors. For some of the studies the Class was divided into two sections, A through L and M through Z. School hours were from 9:00 A.M. to 1:00 P.M. and from 1:30 P.M. to 4:30 P.M.

Some of the members of the Class came from various towns near Boston, living at home and commuting every day. I think hardly a railroad entered the city but brought one or more students. Three of our Class — Duff, Lund, and Norris — walked from Charlestown all through the four years. There were also students from various parts of the country who lived in boarding-houses during the school year. Most of the commuters brought their own lunches. In a sort of second story at one end of the gymnasium was a restaurant, then run by a colored man named Jones.

M.I.T. Photo

Winners of the Charles Hayden Memorial Scholarships assembled in the office of President Compton for presentation of certificates of award by J. Willard Hayden, President of the Hayden Foundation. Seated left to right are Mr. Hayden, Dr. Compton, and Dean H. E. Lobdell, '17, chairman of the committee on undergraduate scholarships. This year's group of Hayden scholarship men includes thirty Greater Boston students and five from New York. The Hayden Memorial Scholarships were established two years ago by the Hayden Foundation as a memorial to Charles Hayden, '90, to assist in the education at the Institute of young men who, by their previous records, show future promise in the fields of engineering and science.

. . . This efficient machine shop is part of the new Sloan Laboratories, providing ample working space that frees the adjacent test floor for appropriate uses.

M.I.T. Photo

In the drawing room, where we lived when not in classes, Henry N. Mudge, '74, was the head instructor, and Henry K. Burrison, '75, his assistant. The former left in June of 1881, but Burrison remained for many years and was much liked. I know we all thought a great deal of him. Professor William Ripley Nichols, '69 (Billy Rip, as he was usually called behind his back), lectured us on general chemistry and qualitative analysis and was in charge of the first-year laboratories, where we worked two afternoons a week. Nichols had a rather sharp tongue, and I think we were a little shy about arousing it. A stupid answer to some question in class would sometimes bring a sarcastic comment.

Professor William P. Atkinson lectured on various subjects — rhetoric, English, political economy, and I have forgotten what else. His talks were interesting but were apt to be rather disconnected. He always gave an examination at the end of the term but never gave any marks; just passed the whole class. We doubted if he ever read the papers. We had three hours a week in French. Jules Luquiens was the instructor — a Frenchman and a very pleasant person. I think we all liked him. Webster Wells, '73, had us for three hours a week in mathematics — possibly algebra, but anyway geometry and trigonometry, I am sure. He was competent and taught for many years.

We had a course of lectures on logic from Professor George H. Howison. I recall nothing about them and am inclined to think that as soon as I had written the last words to my final examination paper I dismissed the subject from my mind. I do not think the course continued after that year. Dr. Samuel Kneeland was the secretary of the Institute and gave us lectures on physiology. We had military drill three hours a week. Lieutenant Henry W. R. Hubbell, Jr., of the artillery was our professor. We had blue uniforms: blouses and trousers and caps with flat visors. Twice during the school year we made a trip down the harbor to Fort Warren, marching through the streets to the wharf.

With the beginning of the second year the Class split up into the various Courses selected by its members. The civil and mechanical engineers and architects had drawing rooms on the third floor under the professors in charge of those Courses. John B. Henck headed the civils, Channing Whitaker, '69, the mechanicals, and William R. Ware, '75, the architects. The miners and chemists were downstairs in the basement, with headquarters in the laboratories. I had selected the natural history course and also hung out in the chemical laboratories. Nichols had qualitative analysis the first term, but gradually the boys were moved into the quantitative laboratory under Professor Charles H. Wing, until I was left alone in my glory. I would also have gone, but Professor Wing had no room for me just then, and I had to stay where I was until the second term. Professor Robert H. Richards, '68, was in charge of the miners for many years and was very popular.

Professor Charles R. Cross, '70, lectured on physics the second year and was a very fine lecturer. He knew his subject thoroughly and explained things in terms easily understood. The lecture hour was from twelve to one, and at the end of the lecture he would ask, "Are there any questions? If not, that is sufficient," and away we would go. Occasionally he would keep right on to one o'clock, and then it was, "Arethereanyquestionsifnotthatissufficient," all in one breath. There were never any questions then.

I think Professor William H. Niles lectured to us on physical geography the second term of that year, but I am not sure. The third year he and William O. Crosby,

'76, Assistant Professor, gave us geology, and I was rather under their charge during the fourth year. Professor Charles P. Otis taught us German the second and third years. Although I used German some in my studies the fourth year, I was anything but proficient in the language. The second half of that third year we had zoology under Professor Alpheus Hyatt, curator of the Boston Society of Natural History. He was a fine man with whom I had much to do during the rest of my time at the Institute.

Professor John M. Ordway taught various subjects, mostly relating to chemistry. There was a saying at the Institute that when a teacher was needed for some subject and no one else was available, the job was wished on Ordway. He was certainly a widely informed man. It seemed to me that there was nothing you could ask him to which he could not give you an answer.

The instructors remained the same during the rest of our years, though of course their subjects changed as time went on. I can say nothing about the work of the three groups upstairs. The chemists and miners lived in the chemical laboratory, and I with them; so of course I knew them best. The third year we had physical laboratory, and there Professor Cross had a fine assistant, Silas W. Holman, '76. There were two men in charge of the Department of Mathematics — Professor George A. Osborne was the head and Professor Gaetano Lanza was his assistant. The latter remained at M.I.T. for many years.

The fourth year all the candidates for degrees worked at their theses. Our Class was the last to be graduated under the presidency of William B. Rogers. He had already resigned, and Francis A. Walker was to succeed him. The next year, 1882, Rogers fell dead on the platform as he was addressing the graduating class: a fitting end for such a wonderful man.

The principal building at the Institute in my time was, of course, the Rogers Building, though it did not receive that name until many years afterward. Near the Clarendon Street side was a one-story building, the women's laboratory, where the women students in chemistry worked. Besides the laboratory, there were two rooms, part library and part laboratory, under Ordway's jurisdiction. Another one-story building housed the School of Mechanic Arts. Over nearer Clarendon Street was the gymnasium, where we had our military drill.

Now of the Class of '81 only five of those who took degrees survive: Came, Collins, Mower, Norris, and Warren.

Councillors and Colloids

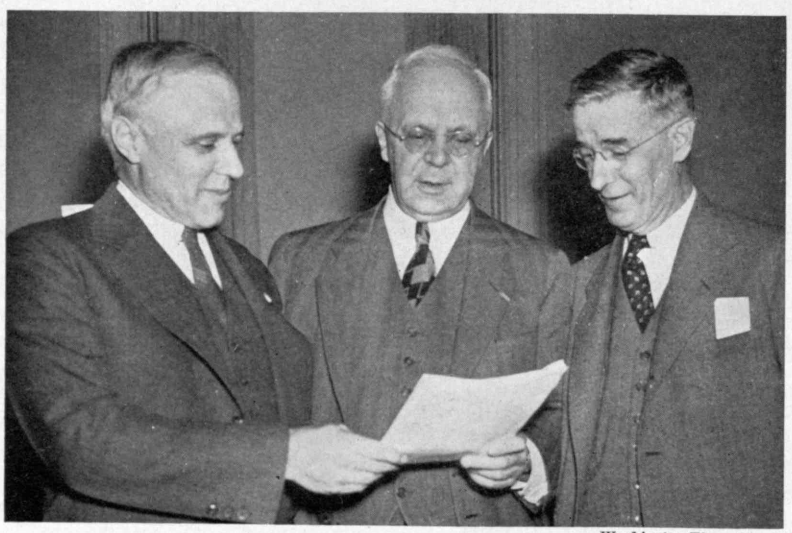
RECENT developments in chemical engineering, with particular emphasis on the colloids, were discussed by Ernst A. Hauser, Associate Professor of Chemical Engineering in charge of the colloid division of the Department, at the 216th meeting of the Alumni Council, held on the last Monday in November. Dr. Hauser illustrated his interesting address by conducting experiments and showing moving pictures.

Before Dr. Hauser was introduced as speaker of the evening by President Henry E. Worcester, '97, various matters of business were transacted. Announcement was made by H. B. Richmond, '14, of the hanging of a portrait of the late Everett Morss, '85, in Everett Morss Hall of Walker Memorial. Richard Whiting, '26, chairman of the Alumni Day committee, reported on progress to date in the making of arrangements for next June's festivities.

Sailing Trophies

THE Intercollegiate Yacht Racing Association recently announced two new racing trophies of special interest to Technology. One of these is the Erwin H. Schell ('12) Trophy, presented to the association in recognition of Professor Schell's notable work as one of the founders of sailing at the Institute as a recreation for students. The trophy was presented to F. Gardner Cox, President of the Intercollegiate Yacht Racing Association, by President Compton, who spoke of the fine influence of yachting as a college sport and recreation. Next fall the Schell Trophy will replace the Boston Dinghy Club Cup as the prize offered for the major regatta of that season.

The second new trophy is named for Walter C. Wood, '17, master of the Senior House and master of sailing activities at Technology. Jack Wood has, perhaps, done more than any other single individual to establish firmly intercollegiate sailing, and the increase of college sailing clubs throughout the country has been influenced by development of the sport at Technology. The trophy was presented to the association by the intercollegiate yacht clubs of Brown and Harvard universities and Dartmouth College, as well as by a group of interested individuals. It takes its place as a trophy for the annual quadrangular regatta which is held between those colleges and M.I.T.



Washington Times-Herald

At a banner meeting of the Washington Society of the M.I.T., Technology notables forgathered. President Compton of the Institute and President Bush, '16, of the Carnegie Institution of Washington are here shown flanking Merton L. Emerson, '04, President of the Washington Society.

DEFENSE AND TECHNOLOGY

(*Concluded from page 110*)

may be stimulated to devise new tactics by which those nstruments can be used to best advantage. Tardiness in doing so has been the traditional weakness of the military commander. The overcoming of this disability probably more than any other one fact accounted for the brilliant German victories in the fall of 1939 and the spring of 1940. If the engineer's military training is intended primarily to stimulate his inventive faculties, there will have to be a minimum of squads-east and squads-west and of maneuvering of horses — whether in polo or in artillery limbers — and a maximum of real training in modern methods of battle.

None of the foregoing should be construed as a declaration for the conversion of our colleges and universities into academies of war or as a desire to Spartanize our society. There is no point in preparing to fight at all if we are not striving to defend what we deem to be the indisputably good ends of life, of which the pursuit of knowledge for its own sake is one of the foremost. The unraveling of the mysteries of the outer universe as well as of objects on this planet is, like great art, an expression of the finest aspirations of man. That such pursuits be displaced is decidedly not advocated. But it is urged that studies specialized to the arts of war be placed *alongside* those specialized to the mechanical arts of peace. This is no time to contract education. It must instead be expanded to include those arts by which our society may be defended from evil.

Finally, a word may be spared on the role which the technological institution shares with any other institution of learning in the teaching of our youth. Whatever may be said or wished regarding the inculcation of intellectual dispassionateness in our students, the fact remains that men cannot fight successfully if they are stimulated only by an analysis in cold reason that their cause is the better one. It would be tragic to depend on a silent reservoir of faith, only to find at the critical moment that our colleges themselves had been instrumental in destroying that faith. To win a war requires enthusiasm and determination. We shall therefore only at our extreme peril disdain to influence conviction. But what is the role of persuasion in a university and in a democratic society? If by the exercise of reason we conclude that certain things which are challenged are worth fighting for, we are compromising neither with truth nor with the ends for which a university exists by indicating that these ideals can be and ought be presented in such light as to provoke the resolve to fight for them. In the event of war, there must be faith in the cause, a spiritual dynamism, not that mild cognizance which is next to apathy. To know what is better does not suffice; we must also want what is better with all our souls, or we shall not have it.

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[8] *Ibid.*, p. 189, note No. 9.

[9] A small portion of this literature is cited in the bibliography prepared under the direction of Pendleton Herring: *Civil-Military Relations* (Chicago: Public Administration Service, 1940), pp. 50–64. The American literature on the subject comprises mostly works descriptive of our industrial effort during the last year; see *ibid.*, pp. 10–33; also *Problems and Policies in Industrial Relations in a War Economy*, ed. Industrial Relations Section, Princeton University (1940).

[10] Vagts, *op. cit.*, p. 1.

[11] André Maurois, *Tragedy in France* (New York: Harper, 1940), p. 49.

[12] "Generalship Old and New," *Horizon*, II (August, 1940), 24.

MAN'S RELATION TO THE COSMOS

(*Continued from page 117*)

of an orbit in space, as we measure them. They would have to be measured at the beginning and end of a half rotation, a requirement which would give an even bigger base line than ours for the triangulation of the universe because Betelgeuse is larger than the earth's orbit round the sun. But unfortunately for the Betelgeusian measures of parallax, the star is subject to radial pulsations. Perhaps the hypothetical inhabitants might be able to detect these from changes in gravitation, but if one were ignorant of the laws of motion, gravitation would be hard to explain. For observers on the surface of Betelgeuse, the radial pulsations of the star would throw the determinations of parallax into such confusion that the local astronomers might even be compelled to postulate a pulsating universe. This digression is perhaps a little more than an idle fantasy: It is a healthy discipline for us to consider how far our findings are inevitably tinged by our circumstances.

Compared to the surface of a star, the surfaces of the planets are Elysian. Nevertheless, life exactly on our terms would not be possible on any of the solar planets. Life on the same lines, adapted to the local conditions, is possible on a couple of them. Jupiter, Saturn, Uranus, and Neptune can be ruled out as possible sites. They are too cold, and probably their dense atmospheres are thousands of miles deep. Mercury is impossible, too; it is devoid of atmosphere and water and subject to intense heat. The planets Venus and Mars might be suitable sites for life of some sort; when I say life, I am thinking of the particular type of animated carbon chemistry of which we, among other creatures, are by-products. Every one of the planets presumably provides all the raw materials necessary for these chemical reactions. Only a few of them present sites where the raw materials can be put to this particular use. And of the three planets that offer any foothold at all, the earth probably presents the best.

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MAN'S RELATION TO THE COSMOS

(*Continued from page 123*)

The earth seems like a very small fertile spot, a veritable oasis in the middle of the cosmic desert. Possibly, even probably, there are other such oases. Absolute exceptions are very rare; in fact, when we ourselves are the exception, a safe rule is to assume that we are indulging in self-deception and self-aggrandizement. Not the slightest chance exists, however, of our ever detecting another oasis. For practical purposes we are occupying the only possible building site that we know.

Let us not be utterly utilitarian. What does the cosmos offer in the way of a view? What do we see from the windows of the world? The view is magnificent. The windows of our house look out upon the stars. How fortunate we are! If we lived on the planet Venus, our sky would be permanently clouded. But from the earth we have fitful glimpses of a vista that should go far to console us for material difficulty and discomfort. I think that most of the glowing descriptions that have been written about the stars have failed. I like best the brief words in which Dante throws off the horrors of the Inferno:

> Whence we came forth and saw the stars again.

HERE is the bill of goods that the cosmos offers to us: The raw materials are the same atoms that build the stars. The site is the best, if not indeed the only one, that we know. And the view is a vista that is magnificent in its austerity. But in this universe, there can be no question of getting something for nothing. How are we to pay for our terrestrial home? What have we to bring to the cosmos? As I said at the outset, we can have what we can pay for. I doubt whether any of us has any conception of how much the cosmos offers to us if only we can pay, any conception even of the nature of the currency. Let me be specific.

First, we bring to the cosmos our *need* — the stark and uncompromising urge for self-preservation and self-perpetuation. It has become such second nature to us that we think of it only with an effort. I mean the continual assimilating, adapting, rule-of-thumb experimenting that our bodies have learned to do unconsciously. There is, of course, nothing simple about the details of the process. Much of it is completely baffling when we consciously try to dissect it. Personally I chose astronomy, after a brief glance at the problems of biology, because I felt that astronomy offered *some* chance of enabling one to arrive at some final conclusions, and biology none at all. Nevertheless, this need is the small change in our transactions with the cosmos, that minimum which we must spend for a bare subsistence.

A bigger coin is *human ingenuity*. Invention is proverbially the child of necessity. Human ingenuity is the coin in which we buy from the cosmos the means to make life not merely possible but pleasant. The greater the ingenuity, the greater the pleasure. If we use our ingenuity to increase human suffering, the more fools we. Most foolish of all is to blame the results on the ingenuity. Lay the blame on the desire to give pain. Don't blame the gun; blame the man who fired it. If guns had never been invented, he would have used a battle-ax or a rock.

Need we have brought to the cosmos; need, and its child, ingenuity. These are the price of dwellings and of food. But man does not live by bread alone. Our lives are not full when we have fed and housed our bodies. We have something further to contribute. Even the most primitive man can bring to the universe a *sense of wonder*.

From unadulterated observation we can piece together a picture of the external universe, a picture which is altogether amazing and which puts a heavy strain on the imagination. Consider the immensity of things — the stars that are counted in billions; the universes that are numbered in hundreds of thousands, each with a stellar population of billions; the distances from star to star, measured in units of parsecs, or 3.1×10^{13} kilometers; the size of our own stellar system, for which that immense unit, the parsec, does not suffice, but which has to be measured in kiloparsecs; or the size of the system of galaxies, which has to be measured not in kiloparsecs but in megaparsecs. Only the limitations of our equipment, I am sure, prevent our having measured the greater system of systems of systems in megistoparsecs — the ultimate conceivable unit.

Enough. I have spoken of only one of the simpler geometrical properties of the universe — a property that depends on principles so well established that we hardly take the precaution of calling them hypotheses any more.

What is the effect on you? On me the impression is stunning — literally stunning. After the first couple of sentences my sense of wonder was blunted, and I was simply reciting numbers. And yet an appeal to that sense, by way of the largeness of things, marks the high point of most expositions of the cosmos. How often has one sat in exasperation to hear an astronomer crush his hearers with numbers! It is almost as dull as being anesthetized with formulas. It is astonishing how few scientific men will speak of the beauty of the universe. They are too much preoccupied with its size.

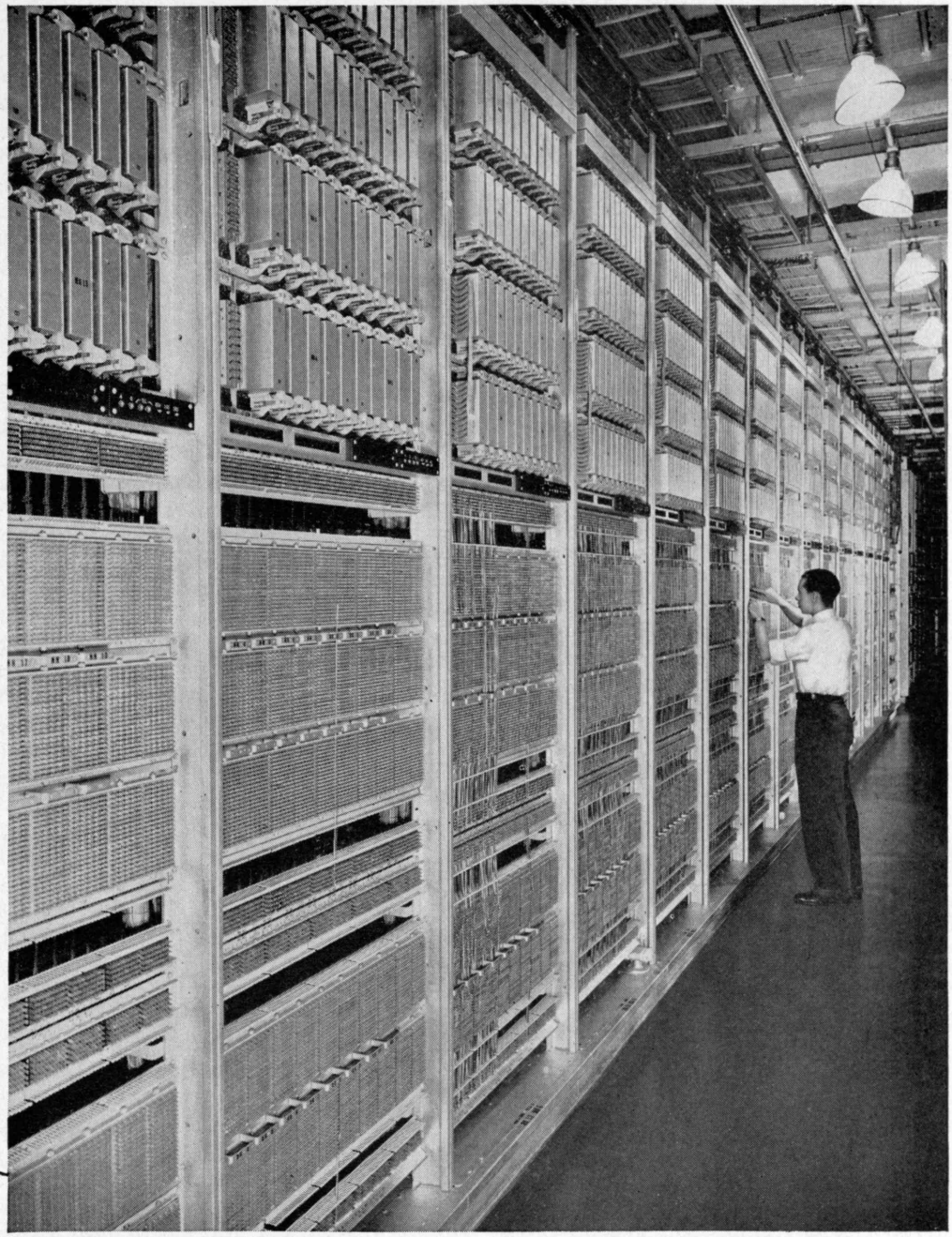
Those who can offer a *sense of beauty* to the universe are paying in valuable coin, and the cosmos makes a rich return. I do not want to be misunderstood when I speak of the beauty of the universe. I do not mean the thrill of standing under the starlit sky; personally I find the sight more terrifying than beautiful. Those who see beauty in it probably find the beauty in association.

Nor am I thinking in the terms of the poet:

> I saw Eternity the other night
> Like a great ring of pure and endless light,
> All calm, as it was bright,
> And round beneath it, Time, in hours, days, years
> Driv'n by the spheres
> Like a vast shadow moved, in which the world
> And all her train were hurled.

That is the sense of wonder speaking in another language — language that does not anesthetize but intoxicates.

No. The spectrum of Canopus is an example of beauty. At least it is intensely beautiful to me. Ah, well, beauty is in the eye of the beholder. (*Concluded on page 126*)



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MAN'S RELATION TO THE COSMOS

(*Concluded from page 124*)

It is not a very far cry from this to the surgeon who describes a "beautiful malignant growth." We have to define what we mean by beauty. The basis is probably the same as with all pleasures — the pleasure of good food, music, painting — and fundamentally I suppose that recognition plays a greater part in all of these than most of us are willing to admit.

The beauty that I see in the spectrum, and in the Grotrian diagrams that represent its analysis, is no more nor less than the thrill of recognition, the ability to satisfy the urge to classify. This sense of classification is the basis of science, still rather an elementary sense, but opening the doors of profound pleasure.

Now we are beginning to get our fingers on the higher denominations with which to buy from the cosmos. A greater step carries us from the joys of classification to the greater joy of interpretation. And that opens up the beauty of the universe fully, in so far as the mere scientist can see it. The whole stress is then shifted in our picture of the cosmos. Interpretation entails a weighing of one thing against another. Hitherto we have been the center of the universe. Now we perceive that our orbit is governed by other things, some of them outside our ken. We cannot take things at their face value any more.

I should have liked to devote this whole essay to expanding that one theme. But I soon realized that I know too little — all of us know too little — to illustrate worthily the truth of the quotation:

> Things that are seen are not made of things that do appear.

Things that are seen, and events that are observed, too, are not caused by things that do appear; any astronomer can tell you that. Many stars, perhaps most stars, are accompanied and disturbed by unseen companions. The galactic system itself turns about a center that is concealed from us irrevocably by the clouds in space. The cosmic rays — one of the major phenomena of the universe — we have no idea where or how they originate.

I get a good deal of pleasure out of elaborating the thought that modern science is concerned with the Unseen. I am not talking mysticism or advocating obscurantism. I am insisting that the current picture of the universe is anything but a cut-and-dried factual diagram. It has the rhythm and coherence of a symphony — the composition and color of a painting. In the symphony, matter furnishes only the strings and the stops of the instruments; in the picture, matter is only the background. The notes of the symphony are sounded by energy; radiation forms and colors the picture. We perceive the cosmos by way of the nonmaterial. We hear the music in snatches — dimly and imperfectly; we have glimpses of the picture from far away. This is the beauty, the intellectual beauty of the universe, of which I spoke. The man of science who has this conception of beauty understands the poet's description of the scientific mood:

> To see a world in a grain of sand,
> And a heaven in a wild flower,
> Hold infinity in the palm of your hand,
> And eternity in an hour.

Let me summarize. In our bargain with the cosmos we are offered raw materials, a site, and a stately view. We offer to the cosmos human need, human ingenuity, a sense of wonder, and a sense of beauty. But one has to pay for what one gets; and the best things are expensive. We have only scratched the surface of what the cosmos has to offer. Our life is circumscribed by the unknown. I suspect that some of the possible returns would stagger our imagination. But we must pay in still higher coin if we expect greater returns.

NEWSPAPER ENGINEERING

(*Continued from page 113*)

After the packing, or backing, the matrix must be freed of all moisture, heated in preparation for the high temperature of the molten stereotype metal, and curved to fit the semicircular casting box. Heated vacuum driers curve the matrix and remove most of the moisture. Final drying is accomplished in curved scorchers heated by electricity. The process of drying and scorching is far from perfect. The correct time, temperature, and vacuum have not been standardized, and uneven drying frequently results. Failure to dry thoroughly will occasion failure of the matrix when the molten stereotype metal expands the lingering moisture into vapor. Excessive drying makes the matrix brittle, and fracture may occur when the matrix is placed in the casting box.

During the drying process, shrinkage of the matrix occurs. This is greater in one direction than in the other because the cellulose fibers lie in one direction and the greater shrinkage occurs along their length. Allowance for shrinkage must be made in the original composition of the page but can be only approximate since the degree of shrinkage is determined by the moisture content. Sometimes the contraction is so great that the printed page is smaller than it should be, and advertisers who have purchased space in the paper must be compensated. At other times the shrinkage is inadequate, and the fixed dimensions of the cast plate cannot accommodate the entire impression of the matrix. Type or picture materials are then defective at the edge of the page.

The heat-conditioned matrix is placed in the curved casting box and is retained in position by clips which are supposed to hold the mat securely in position during repeated castings but do not always do so. Any movement of the matrix will displace the printing surface on the cast plate and thus lead to poor registration of the printed page. Because of variations in the thickness of the original flong or in the pressure applied in molding, the clips may not grasp the mat securely, and printing difficulties will ensue.

Another problem occurs in the cooling of the casting box. Rapid production of plates requires prompt cooling and solidification of the stereotype metal. Water cooling of both the cylinder which forms the core of the casting box and of the outer curved surface which supports the matrix should be effectively controlled. Variations in the rate of cooling affect the structure and surface of the stereotype plate. Variations do occur, and the plates

produced are often far from satisfactory. The temperature of the water in the jackets has not been studied sufficiently to enable the best casting conditions to be determined; until it is, printing will not be perfect.

The proper temperature of molten stereotype metal before being cast is a matter of controversy. The lead-tin-antimony melt is maintained at a different temperature in almost every newspaper plant. These temperatures range from 550 degrees to 700 degrees Fahrenheit; such variation affects rate of cooling and quality.

In the casting operation the molten metal is pumped through a heated passage to a discharge tip, from which the metal flows down into the space between the matrix and the cylindrical core. Air entrained in the falling metal usually rises to the top of the casting before solidification occurs. More than the required quantity of metal is pumped into the casting box so that the imperfections shall not be concentrated in the plate but may rise to the portion above the matrix, forming a "tail" that is rejected and remelted. Too frequently, however, the defects occur in the plate, defects which cannot be observed by inspection but which appear only when the plate is subjected to operating conditions on the press.

Mechanically, the casting machine is an example of ingenuity and splendid machine design; every minute, from a single matrix, it automatically casts and delivers four plates, trimmed to the proper dimension. The overall process, however, is subject to wide variations and uncertainty. A required number of satisfactory plates is obtained, but even the best page is distinctly inferior to the proof taken directly from an engraving.

The process which has been reviewed is the least complicated of all the steps in newspaper printing and the one with the fewest problems. The composing, engraving, and press operations are more difficult, far more involved, and much more uncertain. Clearly, here is opportunity for research, for control, for standardization.

Why hasn't the important business of printing, especially newspaper printing, already been placed on a more certain and scientific basis? Why haven't science and engineering been used to standardize and perfect the operation? The answers are long and involved; more pertinent is the fact that engineering to meet these problems is getting into action. The newspaper engineer is a pretty recent arrival, however, for although the printing industry is one of the oldest, but few engineering colleges have had long-established newspaper-engineering courses. Engineers have not grown up with the business, and it has not been easy to convince all the newspapers or all the practical men in the industry that newspaper engineers are needed. Here and there, however, a progressive management has recognized the value of men with engineering backgrounds, and many of the old-time practical men are lending their experience and advice to young engineers in a mutually beneficial attack on the problems of newspaper printing.

The daily service required of the engineer is much the same in the newspaper as in any manufacturing industry. The duties and methods are those met in practically any modern production organization; the principal difference is that the newspaper industry is just starting to use the scientific (*Continued on page 128*)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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NEWSPAPER ENGINEERING

(*Continued from page 127*)

method and has not had the benefit of internal engineering which so many other industries have had from their inception. The manufacturers of press equipment and other essential apparatus, of course, employ trained designing engineers. But in the newspaper itself, where problems constantly arise and where the value of engineers might be great both in daily operations and in the conversion of requirements into specifications for the equipment companies, men so trained have been very few.

Those newspapers which have employed engineers have found them worth while. The New York *Daily News* now has five on its staff, four of them from Technology. One of the earliest newspaper engineers was William Baumrucker, Jr., '29, who joined that paper as a laboratory assistant and who played an important part in the development of a newsprint testing laboratory. In this work, Mr. Baumrucker was later assisted by a graduate of the Chemical Engineering Course at the Institute, William G. Dodge, '31. The work of the laboratory then expanded to include not only the analysis and specification of ink as well as newsprint but also hundreds of other tasks in the routine operations. Today Mr. Baumrucker is vice-president of the new and widely discussed daily paper *PM*. Mr. Dodge became production manager of the Philadelphia *Public Ledger* and later a contact engineer between the largest manufacturer of newsprint and the newspapers.

Beyond his many daily duties and services, two principal problems face the newspaper engineer. Both are big jobs, ones that will require research and the trained engineer to find their solutions. First is the need for standardization of the present processes, which has been discussed earlier in this article. The best and the easiest way should be found to do the hit-or-miss operations that are being carried on today. It cannot be found overnight but will require hours of effort and experimentation. Some of the work can be carried on within the newspaper plant itself, particularly in the larger newspapers where laboratory facilities and personnel are available; some may have to be done in the better equipped laboratories of research organizations or educational institutions.

The second task, even more important and certainly more difficult, is research in the development of new and better ways of printing. Today's methods are fundamentally the same as those of fifty years ago. Improvements have been made — stereotype plates are produced more rapidly and presses run at higher speeds — but there have been no fundamental changes. The modern press is a huge, heavy piece of equipment. A complete press capable of printing a sixty-four-page standard-size paper weighs more than 700,000 pounds. Elaborate foundations and spring mountings are required. Buildings must be particularly designed to carry the loads of presses and their vibrations. The presses must be heavy in order to retain the stereotype plates in proper printing position at high speed. The plates weigh forty or more pounds, and when the press is operating at maximum speed, each plate exerts a centrifugal force of

nearly half a ton. Variation in plate weights made necessary by the difference in make-up of the pages adds the problem of dynamic imbalance. Place sixteen such plates on a single press unit, and it is not difficult to see why presses are so tremendous and why the designing talent of the press builder is taxed by difficult problems.

Why should plates be so heavy? Perhaps the answer is that since the very beginning of the stereotype process they have always been made of heavy type metal. Actually, the only requirement of a press is to place a thin film of ink in the proper position on a thin sheet of newsprint, and to do so as rapidly and economically as possible. The massive structure of the modern press makes one wonder whether that requirement is not being met in a rather roundabout way. Is this really the way to print? Should not the plate be lighter? Will the newly developed plastics provide an answer?

No one newspaper or its staff can alone do the work implied by these questions. The skill of engineering and science will be needed. The continued co-operation of the designers and manufacturers of present equipment will be essential, and the guidance of the experienced craftsman will be invaluable. Organized research sponsored and financed by the publishers may be the best way of attacking the greater problems. But in the solution of the smaller ones, newspaper engineers may convince the printing managements that engineering has a place in the graphic arts.

As this movement grows, trained men will be needed in the printing industry. Today, few students select their courses to fit them particularly for the problems of modern newspaper production. If men so trained were available, they would play an important part in the expanding business of newspaper engineering. At M.I.T. an elective course approaches the graphic arts from the arts standpoint and provides a good general background. The need for technical courses has not yet, however, been widely recognized in the large engineering institutions.

The opportunities are great, and the problems to be solved are manifold. A student who today can choose studies which will form an integrated course to qualify him for such work will find the problems awaiting him. That training should provide a great opportunity for the newspaper and printing industry, the publisher, the skilled craftsman, and the engineer.

WHAT'S HAPPENED TO TELEVISION?

(*Continued from page 115*)

According to the original standards of the Radio Manufacturers Association, a picture is divided into 441 lines (about 410 of which are active in the reproduced picture); pictures are sent at a rate of thirty a second; and the width of the communication channel assigned to the transmission is about 4.0 to 4.5 megacycles a second (approximately 450 times the space required by a broadcasting station). Working at its best, a system of this kind is capable of reproducing a picture having a quality roughly equivalent to that of a good sixteen-millimeter home movie, with total visible detail a quarter that to be found in the professional thirty-five-millimeter motion picture. (*Continued on page 130*)

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WHAT'S HAPPENED TO TELEVISION?

(*Continued from page 129*)

Whether a television picture like this is capable of supporting an entertainment service is of course a very important question. The prevailing opinion seems to be that the system is perfectly capable of supporting a service carefully planned with the limitations in mind, but that eventually a more detailed image will be demanded. The word "eventually" is important because at present television technique has not progressed to the point where an image of substantially greater detail than this can be produced in a commercially practical system. The question is whether we should go ahead with the present realizable system or whether we should delay commercial operation until the engineers find the way to provide the better image. Were it simply a matter of waiting for a short period of time until techniques now in the laboratory should be reduced to commercial practice, there could hardly be any argument about the more desirable procedure. But the situation is not so simple. The technical answer is not in sight. Moreover, other matters have to be considered.

One of the crucial points is the number of stations which can be accommodated in the spectrum, a question which in turn bears on the degree to which the assignees of television station licenses shall monopolize the ether. The Federal Communications Commission, on the recommendation of the Radio Manufacturers Association several years ago, established the total amount of ether space to be allocated to each station at six megacycles a second, sufficient for the 4.5-megacycle channel previously mentioned and for other technically necessary space, including that for the accompanying sound broadcasts. This amount allows about seven useful television channels at present. Now it is a fact that if the number of details in the picture is to be doubled, for example, the amount of ether space per station must be doubled, and the number of available station assignments thereby halved. Here, then, is a decision of quality versus quantity. Shall there be, eventually, a better television image but a reduced choice of programs? This is the sort of judicial nicety for which a governmental agency's judgment is required, because it is not a matter of engineering; it is a matter of the public interest, convenience, and necessity. The F.C.C. in the present deliberations has let it be known that the six-megacycle allocation is its choice and that this figure may be used as the basis for the deliberations of the National Television System Committee.

At the same time, the commission points to the possibility of twelve-megacycle assignments in a region of the spectrum not yet available, implying that future developments may be taken care of on these as yet unuseful channels. Here the ugly specter of obsolescence reappears, since receivers designed for the six-megacycle channels cannot do justice to the twelve-megacycle broadcasts, nor is it likely that the former could be used at all, especially since the number of lines per picture would be increased, roughly, from 450 to 700. While receivers could be built to cover both values, the expense of so doing would hardly be justified. The implication is that if the original degree of usefulness of the six-

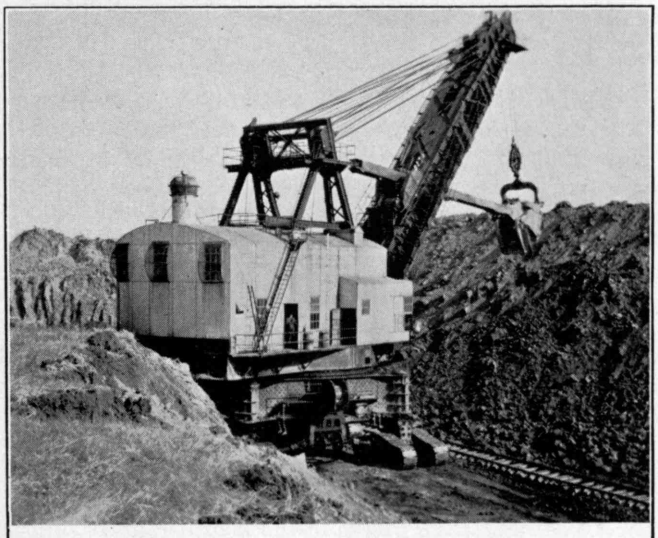
megacycle receivers is to be retained indefinitely, the broadcasters must operate two sets of stations, one for the old receivers, another for the new. This possibility, however, is far in the future, far enough for the Federal Communications Commission to be content to have standards drawn up solely on the basis of the six-megacycle channel.

Once this major aspect of ether space is decided, the subsidiary questions can be attacked. First of all comes the question of the relative degree of detail in the vertical and horizontal dimensions. Offhand it appears that these two degrees of detail should be the same, but tests have shown that a considerable amount of disparity may exist before the eye can detect it. The number of lines in a picture is hence not the bugbear it was once considered to be. For ordinary subject matter almost any value from 400 to 600 lines a picture can be chosen without affecting the picture visibly, as long as the communication channel width is fixed.

Next comes the question of how many separate pictures, or frames, should be sent a second. If the number of pictures is reduced, the detail in them may be proportionately increased, with a given communication channel. Hence the suggestion has been made that only fifteen frames be sent each second, rather than the previously established thirty frames, thus allowing a doubling of the total pictorial detail without a widening of the communication channel. The slower rate of reproduction tends to introduce flicker in the result and to limit the speed with which objects in the picture can move without appearing to proceed in jumps. This matter can be decided only by performance tests, many of which are now being carried out. The committee's judgment will presumably be revealed at the scheduled meeting with the commission.

A third question which arose soon after the National Television System Committee got under way was that of color television. Experiments with color television are not new; most of them produced such poor results or cost so much to operate that none was considered until Peter C. Goldmark of the Columbia Broadcasting System demonstrated colored transmissions late last summer.

These color reproductions were excellent, and the system could be accommodated on the six-megacycle channel. The pictorial detail was lessened somewhat to allow introduction of the color aspect, and the receiver demonstrated had a rotating disk containing colored filter segments, which would presumably increase the cost of the receiver. But the system seemed reasonably satisfactory in nearly all respects except one. At the time of the demonstration, no satisfactory method of thus televising subjects directly in the flesh had been developed. The demonstration was reproduced from colored slides and motion-picture film. A partially satisfactory method of televising in color directly has since been reported but not demonstrated. Whether or not provision should be made for the introduction of color transmissions as soon as the method is perfected, is another question put up to the N.T.S.C. Its considered opinion on this matter will also, presumably, be reported to the Federal Communications Commission late this month. (*Continued on page 132*)



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WHAT'S HAPPENED TO TELEVISION?

(*Continued from page 131*)

The organization of the National Television System Committee follows the proved plan of delegating the fact finding and the preliminary decisions to small groups. In the N.T.S.C. are nine such subcommittees, or panels, each having a specific function. Panel No. 1, headed by Dr. Goldmark of C.B.S., is charged with the analysis of American and foreign television systems as a whole, those which have seen service as well as those proposed. This panel is composed of eleven men who have a broad outlook on the field. Panel No. 2, under Alfred N. Goldsmith, consulting engineer, is investigating the subjective aspects of television reproduction. Dr. Goldsmith's group of ten specialists in optics, biophysics, photography, psychology, and ophthalmology includes Professor Arthur C. Hardy, '18, of M.I.T. Under J. E. Brown of the Zenith Radio Corporation, panel No. 3 contains seventeen men charged with investigation of the specific standards relating to the spectrum occupied by a television station, including the location of the channels for sound and for picture and the space to be occupied by each. Panel No. 4, headed by Elmer W. Engstrom of the RCA Manufacturing Company, is composed of twelve men who concern themselves with the power of television transmitters, sight as well as sound, and their signal-producing capabilities.

The fifth panel, thirteen men under B. Ray Cummings of the Farnsworth Television and Radio Corporation, is considering the essential characteristics of the transmitted wave, such as the manner in which the tones shall be sent (as positive or negative) and how the "black" reference level against which the half tones are depicted shall be transmitted. Panel No. 6, under I. J. Kaar of the General Electric Company, deals with the standards which must be co-ordinated in the design of transmitter and receiver to secure maximum use of the channel. The seventeen men in this panel must see to it that simple ways of matching the receiver and transmitter are offered for standardization. Panel No. 7, of which Daniel E. Harnett of the Hazeltine Service Corporation is in charge, deals with picture resolution, including the number of lines per picture and the number of pictures per second, discussed above. This is the largest group, twenty-two men in all, a fact which attests the basic importance of its recommendations. The eighth panel is concerned with another vital bone of contention: the method to be employed to keep the scanning process in step at transmitter and receiver, the question of synchronization. Nineteen panel members under T. T. Goldsmith, Jr., of the Allen B. DuMont Television Company are attacking this problem. The ninth and final panel deals with the polarization of the transmitted wave, another subject of no little argument. This subject concerns the direction (horizontal or vertical) of the electric vector in the transmitted wave, an esoteric matter on its face but destined to have an effect on the architectural aspect of homes fitted with television receiving aerials.

The main committee, to which the panels report, is composed of eighteen members and twelve alternates under the chairmanship of Walter R. G. Baker of the General Electric Company, director of engineering for

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the Radio Manufacturers Association. To Dr. Baker was assigned the task of organizing and completing the basic personnel of the committee. The National Television System Committee, it should be remarked, is not a part of the R.M.A. but an independent body sponsored by the association with the active support of the Federal Communications Commission.

In the space of less than four months, these groups of men met thirty-four times (one panel met eight times in that period), attended twelve test demonstrations at various laboratories, prepared seventy-six documents on assigned technical aspects of their panels' work, collected bibliographies and other miscellaneous information. This record is little short of monumental, judged by any standard. It is the work of engineers who have their hearts as well as their minds in the work. Their good will is manifest. It deserves the good will of the public and the government to which their recommendations will soon be made.

THE TREND OF AFFAIRS

(*Continued from page 106*)

killer boats bringing their catch to the mother ship for rendering and storage of products. Like the New England merchants who financed the wooden fleets, stockowners in the present ventures expect and often receive unusually high returns. Today, however, whaling ships are so packed with mechanical and chemical equipment that they have gradually grown to a maximum size of over 20,000 gross tons. Norwegians rather than Yankees man these ships, and Norwegian names like Foyn, Christensen, and Gjeldstad are associated with the technical innovations of the industry. The whale oil that made New Bedford a boom town was used almost exclusively for illumination. Today's much cleaner and purer product goes mainly into margarine, lard substitutes, and soaps. Nineteenth Century whalers, who were limited to the few species of whales which floated when dead, lost a good many of the whales they struck and salvaged only the oil in the blubber, and the whalebone, if any. Today's whalemen rival the packers in their efficiency, practically none of the whale going over the side. The Japanese actually pack a good part of the whale meat they obtain, and the Germans might have done likewise had the British blockade not interfered.

Whale oil is by no means the least of the products which the British blockade has denied Germany. World production has been running to about 500,000 tons a year, a trifle by comparison with the world production of 21,000,000 to 22,000,000 tons of animal and vegetable fats, but disproportionally important to Great Britain and Germany, who were in the habit of using most of it. Between 30 and 40 per cent of Germany's margarine and lard compound came from hydrogenated whale oil, while Great Britain classed the oil in importance with wheat and sugar when she began to store foods in 1938.

Gas Turbines on Wheels?

A HEN, it has been said, is merely an intermediate stage between one egg and another egg. Somewhat comparably, a reciprocating engine is an intermediate stage between a steady fuel supply and a steady driving effort. Its back-and-forth action and multiplicity of moving parts are by-products in the quest for a simple and steady motion. In contrast is the obvious appeal in the apparently simple action of a turbine, which involves only a bucket-wheel rotor driven steadily by steam, water, or hot gases.

Although the seeming simplicity of the turbine is somewhat deceptive, the operation of turbines has been mastered to the extent that all hydropower plants and most large steam-power plants use turbines in the interests of maximum economy. In the generation of power by the internal combustion of fuel, however, the gas turbine has lagged far behind the reciprocating engine. Similar in many respects to the steam turbine, a typical gas turbine burns fuel oil in a combustion chamber, allows the resultant gases to expand in a nozzle, and then utilizes the kinetic energy of the (*Concluded on page 134*)

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THE TREND OF AFFAIRS

(*Concluded from page 133*)

gases as they strike the blades of the turbine wheel. Fundamental designs for workable gas turbines have long been known, but only in the last few years have economically practical installations been developed. Almost the only common applications today are for the propelling of torpedoes and for the supercharging of airplane engines. An oil-fired gas turbine locomotive, however, has been announced as in the offing, to compete with the most modern of steam, Diesel, and electric engines; its sponsors predict that for certain purposes it may prove the best of all.

Until recently, gas turbine applications were confined principally to places which had cheap supplies of medium-pressure gaseous fuel or of high-velocity gases. Otherwise the turbine installation had the disappointing net effect of consuming within itself nearly all of the power generated. Useful though expensive power may be obtained from poorly designed engines of most other types, but an oil-fired gas turbine installation will produce no useful output at all unless its individual parts are of high efficiency.

The common oil-fired gas turbine plant has two principal units: the turbine itself and a compressor to supply air for combustion and for cooling. Usually, both units are mounted on the same shaft, and the compressor uses a large portion of the power developed by the turbine. Starting is accomplished with the aid of a small auxiliary engine. The useful power output is the difference between the power developed by the turbine and that required to drive the compressor — a difference which can easily be zero if both turbine and compressor are not of the best possible design. Recent advances in the efficiency of turbines and compressors, however, indicate that a gas turbine power plant burning fuel oil can compete with other modern sources of power.

As power plant for a locomotive, the gas turbine may drive the wheels by means of either fluid transmission or a conventional electric system of a generator and motors. With either drive, the fuel-to-wheel efficiency is expected to be 14 per cent or higher, giving much better fuel economy than do modern steam reciprocating engine locomotives of only 8 to 12 per cent efficiency. The latest turboelectric locomotive has approximately the same efficiency as that expected from the gas turbine but is considerably more complex in that it requires a boiler and condenser. Diesel locomotives are of higher efficiency but burn a more expensive oil, their apparent advantage thus being reduced by fuel costs. For a given physical size of locomotive, it is believed that a gas turbine could supply twice the output obtainable from Diesel power.

A modern Diesel-electric locomotive has about half the fuel expense of a low-pressure steam reciprocating locomotive and costs about four times as much to build. The gas turbine locomotive is expected to permit much greater fuel economy than does the ordinary iron horse and to be of less initial cost than is the Diesel.

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¶ Of CALVIN W. RICE '90, by a memorial scholarship to promote friendly relations with South America established by the women's auxiliary of the American Society of Mechanical Engineers.

¶ Of WILLIAM D. COOLIDGE '96, by his appointment as vice-president of the General Electric Company.

¶ Of FRANK F. COLCORD '98, by his re-election as vice-chairman of the Engineering Foundation, research organization in New York.

¶ Of THOMAS C. DESMOND '09, by his re-election for the sixth term to the New York State Senate.

¶ Of JAMES A. TOBEY '15, by his appointment as chairman of the committee on food and nutrition in national defense of the Institute of Food Technologists.

¶ Of FREDERIC E. TERMAN '24, by his election as president of the Institute of Radio Engineers.

¶ Of IEOH MING PEI '40, by the award of a bronze medal for leadership, service, and merit by Alpha Rho Chi, national social fraternity for students of architecture and the allied arts.

¶ Of KARL T. COMPTON, President, by the conferring of a doctor of science degree at Columbia University on November 25.

Speaker

¶ TENNEY L. DAVIS '13 spoke on "The Identity of Chinese and European Alchemical Theory," at the October meeting of the American Academy of Arts and Sciences in Boston.

¶ BENJAMIN L. WHORF '18 lectured on "Ancient America," at an open meeting of the Theosophical Society in Boston on December 8.

¶ BERNARD S. COLEMAN '19 spoke on "John Q. Public Looks at Tuberculosis," from station WNYC on November 28.

¶ ERNEST H. HUNTRESS '20 discussed "Recent Advances in Organic Chemistry," at the November meeting of the Western Vermont section of the American Chemical Society.

¶ ANDREW P. KELLOGG '24 spoke on "Portable Steam Generating Units," at the November 12 meeting of the Wisconsin Utilities Association.

¶ KENNETH C. REYNOLDS '25 lectured on "Hydraulic Model Experiments," before the Montreal branch of the Engineering Institute of Canada on December 12.

¶ NORMAN D. FITZ GERALD '31 spoke on "Economic Problems of the Petroleum Industry," at the New York Texaco meeting on October 9.

Information, Please

Many Alumni holding reserve commissions in the military or naval forces of the United States have already been called to active service. In the hope that through class notes month by month M.I.T. men may keep in touch with one another, The Review Editors ask that Alumni entering upon active duty send a notification of their new activity and location. Such information may be sent direct to the Class Secretaries or to this office for transmission to the Secretaries for inclusion in the notes.

Appreciation

¶ "Your fine model of the *Mayflower* was a very important unit in our case of ship models which we consider to have been the most interesting part of our exhibit during both seasons." Thus the chairman of the Massachusetts special commission on participation in the New York World's Fair 1940 recently wrote Professor JAMES R. JACK, Honorary Curator of the Institute's Hart Museum.

Written

¶ By HENRY D. HIBBARD '77, "Prehistoric Metals," *Metals and Alloys*, June.

¶ By ARTHUR B. FOOTE '99, "Unemployment — Its Causes and Cure," *Mining Journal*, November 15 and 30.

¶ By THOMAS G. CHAPMAN '09, "The Development of Copper Metallurgy in the Southwest Since 1880," University of Arizona *Bulletin*, July 1.

¶ By DOUGLAS C. MCMURTRIE '10, "Paper History Reviewed As U.S. Papermakers Celebrate 250th Anniversary," *Share Your Knowledge Review*, August.

¶ By RUDOLF E. GRUBER '16, "Guardians of American Health," *America First*, November.

¶ By MANUEL S. VALLARTA '21, "La Radiacion Cosmica," *Ciencia*, September.

¶ By WILLIAM E. YELLAND '30, "Controls for the Size Box," *Textile Research*, November.

DEATHS

* *Mentioned in class notes.*

¶ HOWARD HOPPIN '76, October 19.

¶ ARTHUR N. CLARK '81, November 25.

¶ FREDERIC J. WOOD '88, November 11.*

¶ HOLLIS FRENCH '89, November 21.*

¶ ERNEST V. WRIGHT '89, October 7, 1939.*

¶ OTIS DANIELL '90, October 22.

¶ HENRY WHITMORE '90, November 14.

¶ FRANK BURTON '91, August 30.*

¶ HENRY M. CHASE '91, April 5.

¶ ALBERT L. CLOUGH '91, September 21.*

¶ VERNON A. WRIGHT '91, October 29, 1938.*

¶ ORREN ALLEN '93, October.

¶ L. FREDERIC HOWARD '95, August 17.

¶ FRANK FEELEY '97, October 20.*

¶ ANN HIBBARD '97, October 25.

¶ FREDERICK ST. J. HITCHCOCK '97, July 17.*

¶ LYMAN E. BACON '98, July 5.

¶ CHARLES D. WATERS '99, March 13.

¶ STEPHEN F. GARDNER '00, August 29.*

¶ ARTHUR E. NASH '02, October 29.*

¶ CHESTER H. WELLS '02, July 25.*

¶ ALBERT P. WEYMOUTH '04, November 13.

¶ JOHN R. CARSON '09, October 31.*

¶ GEORGE W. THOM '17, July 23.

¶ HAROLD C. MCLAUGHLIN '18, November 3.*

¶ HENRY W. WRIGHT '18, April.*

¶ CORNELIUS R. CALLANAN '25, March 25.

¶ HAROLD MADSEN '30, June 23.

¶ JOSEPH R. KROWSKI '34, August 4.

¶ HARRY J. HAFLIN, JR., '37, November 6.*

NEWS FROM THE CLUBS AND CLASSES

CLUB NOTES

Rocky Mountain Technology Club

The final meeting of the 1939–1940 season was held at the University Club in Denver on May 24. Regional and competitive scholarships were discussed, and Arnold W. Martin of Monte Vista, Colo., was selected as the successful candidate. Officers for the 1940–1941 season were chosen as follows: Isadore Silverman '28, President; Howard N. Lary '27, Secretary-Treasurer; and Severance Burrage '92, Corresponding Secretary.

On August 9 the Club entertained Ernst A. Hauser of the Department of Chemical Engineering at M.I.T. The fifteen members present found Dr. Hauser a most interesting and affable dinner companion. His entertaining talk stimulated a varied discussion which lasted into the late hours. — On September 18 Charles E. Locke '96 was our guest. He spoke informally of the duties of the Alumni Office and touched on various administrative and academic subjects of current interest to Alumni. His old pipe was not cold at any time during the meeting. After Locke's talk, each of the fifteen members present gave an outline of his experiences since leaving M.I.T. — In October, H. E. Lobdell '17, Dean of Students, was entertained at the University Club, and he in turn entertained us with many and ludicrous incidents that occurred in his office. He is always the same genial Lobby.

Orren Allen '93 died at the Colorado General Hospital in Denver on October 5, following an operation. — HOWARD N. LARY '27, *Secretary*, 822 Midland Savings Building, 444 17th Street, Denver, Colo. SEVERANCE BURRAGE '92, *Review Secretary*, University of Colorado, School of Medicine, 4200 East Ninth Avenue, Denver, Colo.

Technology Club of Milwaukee

The Club had its first meeting of the season on Thursday evening, November 7, at the University Club. After dinner we had the privilege of hearing an interesting discussion on the financial problems of M.I.T. by Horace Ford, Treasurer, our guest of the evening. Mr. Ford brought with him an entertaining collection of color shots of 'round and about the Institute. The changes that Technology has undergone even in recent days were very interesting to all of us.

The members present at this meeting were: H. Koch, John F. H. Douglas '05, Edwin B. Bartlett '06, Louis O. French '10, Roland H. Becker '22, Julius W. Werra '22, Philip N. Cristal '23, Edgar B. Godley '26, Leo Teplow '26, Bruno H. Werra '32, John B. Ballard '35, Robert M. Osborn '36, Arthur L. Sarvis '36, Curt E. Hoerig '38, Michael L. Biancardi '40, Nils M. Rosenberg '40, and your Secretary. — W. A. BJORN '34, *Secretary*, 940 West St. Paul Avenue, Milwaukee, Wis.

Technology Club of New York

"Kiss the Boys Good-by" was the title of the smoker held at the Club on November 14 in honor of the boys who had been called to active duty from the Reserve and the National Guard. A record turnout was present. Much of the entertainment was supplied by Jimmy Walker at the piano, Heine Greer, and Ed Holmes. Everyone had a grand time and agreed that it was a perfect send-off for the boys who will soon be entering the service of Uncle Sam.

The annual contract bridge tournament attracted a large number of contestants this year. It was divided into five sessions, which were held at the Club on October 8, 15, 22, 29, and November 12. Allen Bassett '26 won first prize in the tournament, and received a replica of the Dick Ranger Trophy and had his name inscribed on the trophy itself. Second prize was won by Elmer Hughes '31, and third prize by Alfred T. Glassett '20. This is the eighth year in which the tournament has been held for the Dick Ranger Trophy. Under the chairmanship of William Latham '26 this year's event was one of the most successful in the series. Daily winners in the contest included Alexis Wiren '19, Asher Weil '01, Allen Bassett, and William Latham.

Several class luncheons and dinners are being scheduled at the Club. The Class of '24 held a dinner on November 28. On November 29, '27 had a dinner meeting under the chairmanship of James Bonnar. The Class of '22 had a record turnout at a dinner on December 2. Bill Mueser was in charge. The Class of '09 dinner took place on the evening of December 7.

A Course II dinner attracted a large group to the Club on December 5. The dinner was held during the American Society of Mechanical Engineers convention and was attended by Jerome C. Hunsaker '12 and other members of the Institute staff, as well as by many out-of-town graduates. Guest cards were issued to all M.I.T. men attending the convention. — As this is being written, final plans are being completed for the Course XV dinner to be held on December 12. Erwin H. Schell '12 and Floyd E. Armstrong, both of the Institute staff, are the guests of honor. The topic of the evening concerns the recent elections and is entitled, "How Did It Happen?"

A Course I luncheon is being planned for January 16, during the American Society of Civil Engineers convention in New York. Many faculty members are expected to attend. All out-of-town graduates who visit New York for the convention will receive guest cards and will be invited to make the Club their headquarters, as far as possible, during the convention. — Recent new members of the Club include Meade Bolton '16, Leo I. Dana '17, Robert J. Marlow '17, Herbert A. Kaufmann '21, Robert K. Phelan '30, Armand L. Bruneau, Jr., '38, Alfred F. Wagner '38, and Walter C. Kahn, Jr., '40. — JOHN J. MURPHY '23, *Secretary*, 24 East 39th Street, New York, N.Y. CONSTANTINE S. DADAKIS '34, *Publicity Committee*, 644 Riverside Drive, New York, N.Y.

Technology Club of Panama

President Meade Bolton '16 reports that eighteen former students of the M.I.T. attended the dinner given by the Club on Friday evening, November 15, at the Union Club. They were: Geo A. Orrok '89, William H. Hubbard '00, Arthur P. Porter '04, Meade Bolton, Herman F. Finch '21, Isbell J. McIlhenny '23, Eduardo A. Icaza '23, Gordon H. Crabb '24, Wilmot A. Danielson '26, Walter A. Key '29, Manuel P. Calderon '30, Harold D. Gurney '31, George A. W. Bisbee '32, Earl K. Murphy '34, Constant W. Chase, Jr., '34, John J. M. Carey '34, Verne N. Osmundson '39, and Francisco J. Morales '39. A half century exists between Geo A. Orrok '89 and Verne Osmundson '39 and Francisco Morales '39. — CONSTANT W. CHASE, JR., '34, *Secretary*, Box 77, Balboa Heights, Canal Zone.

Washington Society of the M.I.T.

The Society held its second meeting of the season on Friday, October 18, at the Y.W.C.A. at five o'clock. An exceptionally large attendance of over 140, nearly three times that at the opening meeting, indicates a growing enthusiasm. — Merton Emerson '04, President, recalled the activities of Jimmie Munroe '82, Everett Morss '85, Ike Litchfield '85, and others during the last war, and viewed the influential but quiet and unacclaimed teamwork of the Technology men concerned with national defense at that time.

After introducing several of the speakers, President Emerson called on Karl T. Compton, who presented the usual greetings from the Institute and then launched into a brief résumé of the work that the staff members of M.I.T. are doing in connection with the present defense program. In the course of his address he explained that the situation of the Institute in connection with national defense involves four considerations: (1) the avoidance of any interruption of the curriculum; (2) the contribution of a maximum to the defense program; (3)

the selection for study of problems for which the Institute's equipment is unique, as distinguished from problems which vocational schools and other organizations can handle, such as machine-tool work and subcollege training; (4) the organization of administration so that the staff will be able to attain these ends quietly and efficiently and without danger of bogging down.

Dr. Compton cited the story of the fat lady who fell off the rear of a toboggan on the way down a slide, and of the consternation of the end man remaining when he found she was gaining on him; and likened to this the situation of the Institute in which, as soon as everything seemed well lined up, the problem of organizing the administration would again begin to overtake the program. Citing the old saying that the strength of a city is not in its walls but in its men, Dr. Compton then introduced the men of M.I.T. who are working on the defense problems.

Vannevar Bush, originator and moving figure in the National Defense Research Committee, indicated that as M.I.T. is the most outstanding institution of its kind, it will probably be the center of technological research and will be greatly burdened by defense problems. It must therefore organize to carry the load creditably. He cited chaotic liaison existing between scientists and the armed services in 1917 and 1918, and stated that the National Defense Research Committee has been organized to avoid such chaos, and co-operates with such agencies as the National Academy of Sciences and the National Research Council, the latter now being very active, particularly in connection with the medical sciences.

The National Defense Research Committee is a government office comprising five scientists, including the commissioner of patents and army and navy representatives, and is an executive agency to supplement, not supplant, existing laboratories and agencies such as the National Advisory Committee for Aeronautics, the National Academy, the National Research Council, and the like. The function of the National Defense Research Committee is to find out where research for new war instruments and ideas is needed; provide funds, research contracts, and supervision of research; and form a liaison with the armed services. He said the committee now has at its disposal over 200 scientists and is doing an important job, although it avoids publicity. The committee includes Dr. Compton and Dick Tolman '03. It expects shortly to publish a list of members, heads of divisions, and the like, but not any information concerning the work being done, as the motto of the committee is, "We will listen but we won't talk." Dr. Bush in conclusion stated that our armed services are not out of date technologically; that the army and navy research facilities are excellent and the personnel competent; that the group of scientists affiliated with the committee have been cordially received; and that the committee can call any man anywhere in scientific circles and obtain immediate response on the part of the man and the institution with which he is connected.

Dr. Compton then referred to the preparedness of the Institute for this program and recalled that in 1926 President Stratton had established a course in meteorology; that during 1930 it was decided to maintain this course in spite of the slump; that meteorologists are now vitally needed; and that ninety graduate students are now being trained in meteorology. He directed attention to the Daniel Guggenheim Aeronautical Laboratory and the fact that the Institute had built recently the Wright Brothers Memorial Wind Tunnel, which is now working overtime on army and navy design problems. Dr. Compton further mentioned the recent addition to the facilities for research in aviation engineering. Through the efforts of Alfred P. Sloan, Jr., '95 the Institute has been able to double its power-plant laboratory. Also, much was made of the rapid progress of the Division of Industrial Cooperation, and Nat Sage '13 of this Division called attention to the value of the 1940 "Register of Former Students" and to the fact that over 11,000 men had been carded by his Division for technological jobs. The activities of this Division in connection with meteorologic and army and navy work, and the short summer course in aeronautics being given to graduate engineers were also discussed. He mentioned the organization of a steering committee within the Division, the methods of estimating the organization best able to handle any given research problem, the time element, labor, materials, facilities, and expense involved, and the preparation of tenders and contracts for research problems.

Dr. Compton then introduced Allen W. Horton, Jr., who was assistant to the President of M.I.T. for three years and acted as secretary for the committee on engineering schools of the Engineers' Council for Professional Development. He is with the United States Office of Education engaged in developing the program of engineering defense training. Mr. Horton stated that the aim of this program is to provide curricula on the engineering-school level for pre-employment training, to refresh training of graduate but nonpractising engineers and men of engineering training who did not obtain degrees, as well as to provide in-service training courses. He cited that the army ordnance needs 15,000 material inspectors, who will require three or four months of intensive training, and that the in-service courses will largely have to be given in the evening. Mr. Horton said that his division had available $9,000,000 with which to carry out this program and had set up twenty-two regional staffs to find out six to nine months in advance what training would be required by industry.

Dr. Compton then introduced Douglas Brown, economist in the industrial relations section of the Stettinius committee which deals with the procurement of steel, lumber, wool, hides, leather, chemicals, and agricultural and other products. Professor Brown stated that his division tries to match military and civilian requirements for materials against probable supplies, and attempts to increase the supply in the event of a prospective shortage.

The effect of the call for reserve officers and the prospective draft on the personnel of the Institute was not passed over. The Department of Military Science and Tactics at the Institute has lost all but one staff man, and of the four hundred members of draft age seventy are in the Department of Electrical Engineering. Dr. Compton stated the policy of the Institute would be to let the men go on any call for service for which they are uniquely qualified, but that if called for ordinary service that could be handled by others, exemption of the staff members would be asked because of their work for the national defense. Dr. Compton reported that the Corporation has authorized the executive committee of the Institute to supplement the salaries of the men called to defense service so that they can undertake their service without excessive financial sacrifice. In this connection the Institute has created an M.I.T. National Defense Fund for allowances to enable men to contribute their time for $1.00 a year, or other unremunerative sum, and by providing for leaves of absence with pay and for the paying of substitutes of a lower salary from the fund.

A directory of the M.I.T. Alumni in Washington, which had been prepared at the Institute but which omitted all the officers and many members of the Society because of the fact that they live in near-by counties in Maryland and Virginia, was passed out at the conclusion of the meeting. Many members thought the directory very fine, but said that it should be revised to include all members living in Montgomery and Prince George Counties, Md., and Arlington and Fairfax Counties, Va.

Following the program an enjoyable dinner was served to the following M.I.T. men and guests: Granville H. Parks '87, Charles L. Brown '88, George W. Stone '89, John G. Crane '90, William B. Poland '90, Frederick W. Swanton '90, Walter P. White '92, Charles G. Abbot '94, Joseph W. Clary '96, George E. Stratton '96, Proctor L. Dougherty '97, Benjamin A. Howes '97, Frederick A. Hunnewell '97, Henry M. Loomis '97, Martin Boyle '98, Thomas M. Roberts '98, Marcy L. Sperry '00, Charles H. Stratton '00, John Boyle '01, Gardner Rogers '02, Walter L. Cook '03, Merton L. Emerson '04, Harry H. Groves '04, Amasa M. Holcombe '04, Henry L. Lyman '04, George H. Shaw '04, Reginald A. Wentworth '04, George N. Wheat '04, John C. Damon '05, Warren K. Lewis '05, Edward T. Steel '05, Ralph E. Tarbett '05, Arthur L. Sherman '06, Louis H. Tripp '06, Parker V. Dodge '07, Stuart C. Godfrey '07, Edward D. Merrill '09, Benjamin S. Hirschfeld '10, David J. Guy '12, Max C. Mason '12, Aksel M. Pedersen '12, George A. Robinson '12, Tenney L. Davis '13, Nathaniel

1889 Continued

Emery's address is now 615 Grove Street, North, St. Petersburg, Fla. — Frank Hobbs has been elected chairman of the board of directors of the Wentworth Institute in Boston to succeed the late James M. Morton, Jr.

Welles Bosworth is now established at "Old Trees," Locust Valley, N. Y. At the Secretary's request Welles furnished the following account of the escape of himself and his family at the time of the invasion of France last summer: "It is painful to write about our escape from France. No one who has lived there and come to know the noble natures of those proud, brave human beings could have witnessed their sufferings without being haunted by visions of their agonized dismay. . . . *Fluctuat nec mergitur*, the motto on the coat of arms of Paris, should be adopted as the motto for the French people as a whole, for it typifies both their past history and their spirit. . . . The story of the nightmare of last spring is now well known, and unless one is interested in the special experiences of some personal friend there isn't much that remains to be told. Of course, whenever or wherever fear is the dominant note life is miserable. . . . Existence through day after day of physical fatigue under abnormal health conditions and lack of sleep is more than any man or woman can well sustain. You may easily imagine, therefore, our state of thanksgiving when at last we found ourselves in Lisbon aboard the good American ship *Manhattan*, sent by the United States to rescue refugees. I said then, 'Now not another word of complaint or criticism from me.'

"We left Paris, or rather our home near by at Vaucresson, on May 10, when we heard that Belgium had been entered, and went to our house near Blois, where we had spent the winter, expecting to remain there till the war was over! We had been assured by both French and British that the enemy would never get that far. I had been saving gasoline all winter in spite of rationing, and had accumulated over four hundred litres. I had also bought a secondhand trailer to carry the fuel in, realizing that a sufficient amount to carry us to Lisbon (where I thought we should go) could not be carried with us in our Lincoln. Besides, if we had to fly, none could be bought en route. When the enemy crossed the Seine, we knew it was no longer safe to remain in Blois, so we sadly packed a few bags; with the two children and my wife's mother, we left for Biarritz. The roads were jammed with refugees from Belgium, Northern France, and neighboring sections — a sad sight. Most of the refugees had mattresses camouflaged with branches of trees on top of their cars. There were no rooms in the inns, so the travelers slept on the roadside. All the townspeople looked at the cavalcade with reflected fear. The armored tanks traveled sixty kilometers an hour, and nothing could stop them.

"There was still plenty of food, but we were forced to go around or to continue through the big towns, and to keep going. Fortunately, I had a permit to circulate, which I had secured in advance from the Minister of War. Because of this and my connection with the ambulance corps we were given 'beds without sheets' in an army hospital one night, and were taken into an overcrowded house by friends the next, so we reached Biarritz without hardship. There we found great comfort in a fine hotel, thanks to reservations made by an influential friend, though crowds were being turned away everywhere.

"But alas, our good fortune was of short duration. The hotel was suddenly commandeered by the government, and all were turned out at a few hours' notice. Bordeaux was being bombed. Where to find rooms? After a scramble we found them, thanks to a tip, in the home of the hotel cook! Comfort and good food were ours, and we were far enough out of the town not to be bombed. Here we planned once more to remain till the war was over, but our American friends began to disquiet us, urging us to go on to Lisbon, at least, while it was still possible to move. People crowded the passport and visa consulates, some, ill with fatigue and anxiety, standing in line three days for permits. My wife and her mother, being French and not expecting to leave France, had not obtained permits. This lack greatly complicated matters for us. My permit was in order, and the children were included on mine, but my wife and mother-in-law were obliged to begin at the beginning with all the official red tape for which the French are famous. First at Biarritz, then Bayonne, and back to another bureau in Biarritz we went, and each day we were told that this was to be the last for allowing French people to leave France. To cap the climax, the ladies' passports were lost by some official and could be found nowhere. Back and forth we went, to and from Bayonne, wasting gasoline as well as time, standing in line for hours, trying to have a word with the exhausted officials. Finally we found that a stupid functionary had mailed the passports, and they had therefore been sidetracked. When my wife and her mother had recovered them and gone to get the visas, they were told that no more permits could be given, and the office was closed. I said, 'Never mind, we'll take our chances with the French who have to stay anyhow.' They remembered, however, that the officer in charge of the bureau, a friend of mine, had promised to give them their visas when they got hold of the passports. They got to his office before he arrived next morning, and he stamped their visas and then destroyed his stamps, saying, 'You are the last two Frenchwomen to leave France.' We had filed applications to join the American convoy for Lisbon, in spite of rumors that all valuables would be taken from us at the border. We were assured afterward, however, by the consulate that this despoiling would not apply to the American group. The money question was a problem that no one seemed to know how to answer. Only enough francs could be taken out of France to pay for about two days living in Spain; and what then? I had a letter of credit from New York and knew I could manage with that, but all the convoy were harassed and embarrassed from day to day. Many people borrowed from the Red Cross to get home. When we left, one day ahead of the Germans' entry, an edict had been published forbidding cars to circulate except for the transportation of food. We got off early in the morning, however, and were not stopped till we reached the bridge between France and Spain. There we were stopped indeed, for we had to wait in line from 11 A.M. until two o'clock the next morning, when we were allowed to go through. We motored in the night to San Sebastián.

"Chapters could be written describing our experiences until we reached the *Manhattan*. Each day was filled with uncertainty about what to do and with waiting in crowds at the consulates, where no one could tell us much. When would the boat come? Where would it come to? How could one be sure of being taken aboard? Were there rooms in hotels? How much Spanish money should we draw, as none could be taken into Portugal? Questions without end cropped up, but in the due course of events everything was straightened out.

"I have sketched a few salient outlines to give you an idea of what our experiences have been. From these you can imagine the rest, but you cannot realize the sadness provoked by the sight of the poor, baffled, astonished, even terror-stricken French people." — WALTER H. KILHAM, *Secretary*, 126 Newbury Street, Boston, Mass.

1891

Albert L. Clough, who died on September 21, was a well-known citizen of Manchester, N.H., and was active in the political life of that city. He had been a prominent automotive engineer for nearly forty years and was a member of many city and state organizations. He is survived by his widow, three married daughters, and seven grandchildren. The following is taken from a local paper: "Albert Lucien Clough was born in Manchester on June 24, 1869, the son of Lucien B. and Marie L. (Dole) Clough. He received his elementary education in the public schools and graduated from Manchester High School with the class of 1887. He then attended Massachusetts Institute of Technology, graduating in 1891, and followed this up with a year of postgraduate work at Harvard. Mr. Clough entered the employ of the General Electric Company at Lynn in 1892. After working there for a year as an engineer, he returned to Manchester and assisted his father in his insurance business, finally succeeding to it and carrying it on until 1897. He gave up the insurance business to return to his former love, electrical engineering. For many years he was in constant demand, chiefly in the line of a consultant. From 1897 to 1903 he was general manager of the Brodie Electric Company.

1891 Continued

"From the very beginning of American activity in the designing of a practical motor vehicle, Mr. Clough kept himself informed, and being a trained engineer, put his mind to the task of mastering the principles and mechanics of the new machine. When the automobile came upon the market, he not only possessed a two-cylinder St. Louis car but taught other local owners almost everything they had to learn about the operation of their machines. It was not long before his knowledge spread outside of Manchester and he was asked to write a column for a Baltimore syndicate. Appearing under the title of 'Hints for the Motorist', Mr. Clough's column was published three times a week in as many as 100 newspapers in this country and Canada. The column was discontinued in 1934 after having appeared for 18 years.

"He was an outstanding member of the Manchester Institute of Arts and Sciences and his great interest in this cultural organization brought him to the presidency in 1898, a position he has continued to hold until his death. Mr. Clough entered politics in 1910. A special election was held in April of that year to fill the vacancy on the Board of Mayor and Aldermen from Ward 2, caused by the resignation of Joseph H. Geisel, who had been elected a member of the Board of Assessors. Mr. Clough was elected and took office on May 3, 1910. From that time on he was successively reelected alderman from that ward until his retirement at the end of 1939, giving more than 29 years of conspicuous service to the city. During his long tenure of office, he was honored twice. In 1935, the city government gave him a testimonial upon the completion of 25 years of service and last December, the entire city government turned out to honor him at the final aldermanic meeting of the year. In becoming an alderman, Mr. Clough did not consider it sufficient to attend the aldermanic meetings and seek favors for his constituents. He made it his duty to learn the duties and activities of each municipal department and it is the opinion of many officials that he was better versed in municipal affairs than any other resident of Manchester."

Frank H. Burton died on August 30 at his home, 4 Chestnut Street, Boston. His wife reported his death to the Alumni office. We have not as yet obtained any further information, although we wrote to Mrs. Burton. — Vernon A. Wright died on October 29, 1938, according to information given to the Alumni office by Mrs. Wright. He was chairman of the board of the Otter Tail Power Company, Fergus Falls, Minn., and that is given as his last address.

A letter came to us last September from Harmon Wendell of Detroit, Mich., who was listed in our last address book as with the American Industries Corporation. He mentions the death of Dudley Watson some years ago. Wendell's letter follows: "The class book, forty-fifth anniversary, asks for the present address of Dudley Sears Watson of Toledo, Ohio. Dudley and I were classmates. He was the son of Phiny Watson, a wealthy wholesale grocer of Toledo, and was a young man of exceptional character and great natural ability. Threatened with lung trouble, he left M.I.T. to live in Denver, Colo., where we spent a winter together. He married a beautiful Toledo girl, sold out his interests in Toledo, and moved to Denver where he invested his capital in real estate. I was told that he lost everything when the Denver boom burst and that he later died of consumption. Watson was a splendid, talented fellow.

"Another chap whose address is desired is John Downey Clarke. He and I and George Vaillant were roommates in a house on Boylston Street. I never knew what became of J.D., as we called him; perhaps Vaillant may know. J.D. came, I think, from Georgia. — Now that I am nearing the end of the road, I thought I would tell what little I know of these two missing members of the great old Class, before, like Alice, I pass through the looking glass of this life into the mysterious regions beyond."

Another one of our "lost" classmates was Charles K. Drake. Charlie Ricker ran across him this summer, and says he is living at Kearsarge Hall, North Conway, N.H. — George W. Favor was also on our lost list, but according to the new "Register of Former Students" he is not living. The date of his death is not given.

The Class now has a great-grandchild, undoubtedly the first arrival in the fourth generation. Her name is Judith Clay, and she was born in New York City on June 28. Her mother was Jane Clay, her grandmother Miriam Holden, and her great-grandfather Harry H. Young. Can anyone else qualify? Incidentally, Harry's daughter, Mrs. Holden, was the class baby. — Since the last Review a general notice has been sent out telling of Barney Capen's move to Saxonville, Mass. He lives on Maplewood Road, which leads off of Elm Street near the center of the village. Mrs. Capen lives in Framingham, only a few miles away. Several of us have been to see Barney since he moved, and he hopes that others will call on him.

We stated that our fiftieth reunion would be held at the Corinthian Yacht Club, Marblehead, but this has been changed to the New Ocean House, Swampscott, Mass. You will hear from our chairman, Harry Young, in due course. — Charlie Garrison has been here and gone. He motored across the continent and back again and thought nothing of it. Henry Bradlee gave us a nice luncheon at the Union Club with Charlie as our special guest. Charlie spent some days in Cambridge and then went to his old haunts on the Cape. He is looking fine, hasn't changed at all, but we are greatly disappointed to have him say that he does not expect to attend our fiftieth. Because of the heat June is a bad time of year to motor across the continent, and he and his family now are permanently located on the coast.

The following changes in address have been received: Charles W. Ricker, Post Office Box 1715, Havana, Cuba; Professor William H. Lawrence, Room 5–115, M.I.T., Cambridge; Professor Arthur C. Smith, 2116 Knapp Street, St. Paul, Minn. — HENRY A. FISKE, *Secretary*, Grinnell Company, Inc., 260 West Exchange Street, Providence, R.I. BARNARD CAPEN, *Assistant Secretary*, 1 Maplewood Road, Saxonville, Mass.

1895

Apparently a number of our classmates are interested in some phase of national defense and are too busy to let your Secretary hear about their interests and welfare. The last two issues of our class notes have emphasized the final "graduation" of a number of our most active and enthusiastic men, and in this list we reported the passing of our Class President, Tommy Booth. Tom served us long and well. He guided our interests for nearly twenty years and did a good job. We must now elect a new president. The election is already under way and we hope to have all the ballots by the first of the year. Announcement of the results will be made in these columns. If for any reason you have delayed sending your ballot, please attend to the matter immediately. — LUTHER K. YODER, *Secretary*, 69 Pleasant Street, Ayer, Mass., JOHN H. GARDINER, *Assistant Secretary*, 10 Clinton Place, Mount Vernon, N.Y.

1896

Opportunity was taken of Arthur Baldwin's visit to Boston to have a gathering of classmates for luncheon at the Engineers Club on November 20. Those who were able to attend were Arthur Baldwin, Harry Baldwin, Damon, Davis, Driscoll, Grush, Henry, Hersey, Hultman, Locke, Rockwell, and Underhill. As frequently happens with impromptu affairs, this turned out to be a very enjoyable occasion, continuing for two hours, and even then some were loath to depart. Arthur gave us an intimate picture of conditions in France up to last March, when he came back to America, and also gave his interpretation of European affairs and the aims and objectives of the totalitarian powers. Another excellent contribution to the discussion was made by Grush, whose son had been in Germany for two years and had thus learned something of the German side of the picture. As far as we could discover, Arthur now has a deferred status because there is nothing that he can do in Paris along the line of his former work as vice-president of the International General Electric Company in charge of the company's European affairs. He has therefore engaged a house at Charlottesville, Va., where he plans to spend the winter, and it is possible that he may become permanently located in that charming part of the country. — Henry Hedge had hoped to attend the luncheon, but at the last minute couldn't.

Charlie Nevin would have come were it not that he and Mrs. Nevin were scheduled to leave Newton two days later for Orlando, Fla., to spend the winter in accordance with their custom of the past few years. He has seen Irv Merrell in St. Petersburg and reported that Irv, al-

1896 Continued

though supposed to be in retirement, actually finds it difficult to remain idle and therefore conducts a real estate business in St. Petersburg. — An item of news contributed by Harry Baldwin was that he is chairman of the Local Board 146, Selective Service of Swampscott, Marblehead, and Nahant. His territory contains 2,420 registrants for the draft. On November 20 this board sent its first quota of three men, all of whom were found to be fully qualified and who were consequently accepted, a record of which Harry is naturally proud, because other districts in surrounding places have had a number of men rejected as not being fit.

A particularly pleasing feature of this luncheon meeting was the presence of Ralph Henry, who had not been a regular attendant at class gatherings although located right here in Boston in the architectural firm of Henry and Richmond. Henry's only alibi was that he had had to keep his nose so close to the grindstone that he did not seem to find time to participate in class affairs. He does really seem to have been busy, as during the last year or two he has built a new library building for the Babson Institute at Wellesley, a new wing to the Museum of Fine Arts in Boston, and the large United States Public Housing Project in South Boston. Perhaps his most unique job was the construction, on an estate in Lincoln, of a private bomb-proof shelter which is believed to be the only structure of its kind so far in this country. Except for the doorway, the shelter is entirely concealed in the wooded slope of a hill, and consists of a generous living apartment with its necessary appurtenances. The shelter is completely self-sufficient, having its own local generator plant, air conditioning, and obscure double means of entrance and egress. The construction of this underground shelter, calling for the use of properly designed layers of sand and reinforced concrete, involved extensive research on bomb-penetrating power and study of bombing effects in England today.

The press has generally featured the promotion of William D. Coolidge to a vice-presidency in the General Electric Company. This apparently does not mean any marked change in his duties, as he will continue to direct the research laboratory of the company in Schenectady. Dr. Coolidge has also been named as one of the twelve members of the newly organized National Inventors' Council, a body created by Secretary of Commerce Harry Hopkins to encourage civilian inventions as part of the national defense program. It is composed of twelve scientists and industrial leaders and will cooperate with the National Defense Research Committee. You may recall that during the World War Dr. Coolidge developed a portable x-ray outfit for use in army field hospitals and was one of the General Electric scientists who worked on submarine detection. A discovery of his led to one of the first effective detectors, and it was named "C" tube in his honor. Dr. Coolidge recently received one of the Modern Pioneer plaques of the National Association of Manufacturers for his contributions to science, particularly in x-ray.

Jacobs had to come down from the University of Vermont to attend a meeting of the new projects committee of the New England Council in Boston on November 1, and the Secretary had the pleasure of a real visit with him. He seems to find his time fully occupied because, in addition to his teaching duties and the care of his seismograph station, he is also state geologist of Vermont and has to do considerable traveling to keep in touch with all the latest mineral developments. This last year he was able to get some recreation, however, at a cottage north of Burlington on Lake Champlain. He became the owner of this cottage at the beginning of the season and is finding that, like any piece of real estate, it always provides plenty of things needing attention to take up a man's time.

Con Young has reported his arrival at Fort Myers, Fla. For a while this year he is going to be in a nice little house on a paved street just back of the beach-front houses. It is sixteen miles inland on the south bank of the Caloosahatchee River. He is not certain whether he and Abby will continue there through the winter or take a house in town. — A nice note has also come from Walter Stearns expressing his appreciation of the way his case was mentioned in the November issue of The Review. Walter does not seem to be at all concerned over the outcome of the government's suit, if it ever comes to trial, but the publicity he has received has not been entirely pleasing. Incidentally, he reported that Arthur Baldwin was in Schenectady on November 11 giving a talk before the American Legion on what happened to France.

This issue of The Review will be coming into your hands on or about New Year's Day, 1941, when you will presumably have acquired a new calendar on which to enter your engagements. The first thing you should do on this calendar is to mark June 5, 6, 7, and 8, Thursday to Sunday inclusive, for the observance of our forty-fifth anniversary at East Bay Lodge, Osterville, Mass., followed by Alumni Day at M.I.T. in Cambridge on Monday, June 9. — CHARLES E. LOCKE, *Secretary*, Room 8–109, M.I.T., Cambridge, Mass. JOHN A. ROCKWELL, *Assistant Secretary*, 24 Garden Street, Cambridge, Mass.

1897

Frank G. Feeley, II, died in Pittsfield, Mass., on October 20, leaving a wife, one son, and one daughter. At the time of his death he was chief engineer of the E. D. Jones and Sons Company, machinery builders and founders. After being graduated Frank held positions successively with the Eastman Kodak Company, the National Fire Extinguisher Company, the M. D. Knowlton Company, box manufacturers of Chicago, and finally returned in 1927 to Pittsfield, where he had been associated with the E. D. Jones Company ever since. During the World War he served in the engineering department of the United States Shipping Board. He took an active part in community welfare work in Pittsfield, was an organizer of the Community Cupboard, and prominent in Pittsfield Community Fund Association affairs. He was a trustee of the City Savings Bank and a member of the First Church of Christ, Congregational. Although Frank was not often present at class reunions, he will be remembered by all as a loyal friend, quiet and unassuming, a keen student, with a wonderful understanding of all matters relating to mechanical engineering. — We have been advised that Frederick St. John Hitchcock, I, died on July 17. He had been connected with the Chapman Technical High School in New London, Conn.

Once again distinction has come to William C. Potter, III, chairman of the Guaranty Trust Company of New York. From *Business Week* of October 5 we learn that the "bankable contract plan" adopted by the National Defense Commission for use in financing the construction of new industrial plant capacity was developed from a suggestion made by Mr. Potter. The plan is too complex to be given in detail here, but as it works out it prevents the government from ever using the plants for commercial purposes, and at the same time it ensures that the government does not give a plant to a contractor to the disadvantage of his competitors.

J. Franklin McElwain, prominent shoe manufacturer whose company was merged late last year with the Melville Shoe Corporation, recently reported the completion of the one hundred millionth pair of shoes for the Melville corporation. Mr. McElwain is honorary president of the National Association of Shoe Manufacturers and has been connected with the manufacture of shoes since shortly after he was graduated from Technology. — JOHN A. COLLINS, JR., *Secretary*, 20 Quincy Street, Lawrence, Mass.

1900

Does any classmate know the address of William L. Fitzpatrick or Samuel H. Crittenden, III? We have had no recent news of them. . . . Zenas M. Briggs, who retired on January 1, 1938, from the engineering department of the Pennsylvania Railroad Company, is in business in Pittsburgh from April to October. He lives in Los Angeles during the winter. His last letter says: "Thank you for the account of our class reunion. I am very sorry to have missed the gathering. . . . I reached Boston on Friday, May 31, during a heavy rain and decided to go on to New Bedford, thinking my brother would be able to drive me to Osterville. His car was laid up for repairs, however, and I could not figure any way to reach the Lodge. . . . I didn't get to the doings at the Statler, either."

Cayvan writes: "I'm still superintendent and consultant for the Dutch Tea Rusk Company, Holland, Mich. . . . We have the only rusk approved by the American Medical Association, and . . . we've taken first and second prizes for our biscuits and crackers for the last fifteen years. — I can't get East for reunions, as the new crop of flour isn't in

1900 Continued

by late May . . . and the end of a wheat crop is sometimes very inferior. . . . That was mighty nice of you to send out résumés of the class reunion. . . . George Holbrook and I were very chummy while going through M.I.T., so it was quite natural that George should write to me to see if the two of us could drive together. . . . Late August finds my wife and me in our little one-design class sailboat, the *Sea Gull* (on Torch Lake, an eighteen-mile lake 161 miles from here). My wife was brought up with three brothers in a boat at Annisquam. . . . One of the fellows from the plant is in Technology in the three-weeks course in bacteriology. He is a nephew of the boss and is a fine fellow of twenty-four. I am preparing him to succeed me."

Wilbur Davis has been busy enough in the last ten years, as evidenced by the fact that his writings include a history of Boston as disclosed in digging the Commonwealth underpass and many subways and tunnels, and, with another man, *Relief Breaks on the Two Cent Stamp of 1890*. Another book on philately, *Early Boston Postal Marking*, is in process of compilation. He says: "It is of utmost importance to me that I have grown ten years older. I was assistant chief engineer of Boston from 1930 to 1932 and chief engineer from 1933 to 1940. I have built the Boylston Street subway extension, the Sumner Tunnel to East Boston, the Haymarket Square improvement, the Huntington Avenue subway and underpass, the new Park Street platform, and many other small constructions in Boston."

Here is part of a letter I received recently from Hughes: "I was awarded a cash prize by the Lincoln Foundation (sponsored by the Lincoln Electric Company) for a paper on welding. I have contributed articles on engineering subjects to 'National Encyclopedia,' 'World Book of Knowledge,' and 'International Year Book.' I have well in hand a book for students, designers, and engineers on the selection of engineering and building materials. In addition, I have been engaged in various engineering activities and have been consulted on matters pertaining to ferrous and nonferrous metals and nonmetallic materials."

We regret to record the passing of Stephen F. Gardner, II, of Washington, D.C., on August 29. A notice was received from Mrs. Gardner recently. Since graduation Gardner had been with the Standard Engineering Company in their Washington office and in later years was president of the company.

Wickes is now associated with Harvey S. Mudd, Los Angeles, and gives as his activities the following: director, Cyprus Mines Corporation, Compania de Petroleo Ganzo Azul Limitada, director and treasurer of Cactus Mines Company, president and director of New Idria Quicksilver Mining Company, and president and director of Calpine Corporation. — Jennings writes: "Another ten years have been added to my service with Irving and Casson (A. H. Davenport Company), making a total of thirty-eight years. With the amount of business I am able to produce nowadays, I sometimes wonder if the firm knows I am still working for them."

Sullivan W. Jones tells about his activities since 1933: "From 1933 to 1934, I was chief of staff, industrial advisory board, N.R.A.; 1934 to 1935, chairman, National Construction Planning and Adjustment Board; 1935 to 1936, assistant co-ordinator for industrial co-operation; 1928 to the present time, chairman, national elevator safety code commission, American Standards Association." — Keith writes from Chicago: "I received the letter which you sent to the members of the Class telling about the fortieth reunion, and I certainly thank you for your thoughtfulness. It must have been a grand get-together, and I was very sorry to have had to miss it. The year of the Western Society of Engineering closes on June 1, and there are so many things which must be taken care of in closing the old year and starting the new that it is absolutely impossible for me to leave at that time."

Ike Osgood, now retired as manager of the Boston Board of Fire Underwriters, writes: "I have no conspicuous achievements. My chief interest now is in giving what community service I can. I'm a trustee and treasurer of the library, cemetery association, and taxpayers' association, vice-president and treasurer of the North Andover Historical Society, trustee of an old ladies' home, member of the town planning board, a director of the Lawrence Community Chest, Inc., and so forth. So you see I keep quite busy, mainly on affairs that do not call for great physical activity."

Part of Reimer's last letter reads: ". . . For the past seven years I have been fighting arthritis, and for five years I've been entirely out of business. Two canes help me get around a little each day. . . ." — Percy True writes: "I lead the usual life of one who is interested in his work and the life of the community in which he lives. I am a member of the school board and the library board, and I was president of the Elgin Country Club in 1933 when being president of a country club was no soft job. . . . I retired in the middle of July (on a pension, not social security). My sister and I spent August on the Penobscot River near Belfast, Maine, within twelve miles of my grandfather's old home on the St. Georges River. Circumstances have not made it convenient to identify myself with the activities of '00. The demands on a two-weeks vacation each year are rather heavy. Thank you for reminding me that I still belong to the Class. . . ." — C. BURTON COTTING, *Secretary*, 111 Devonshire Street, Boston, Mass.

1901

Pending replies to the annual class letter, which was not mailed until about November 26, the news for 1901 class notes is limited but does include certain interesting items, to wit: In response to a request from those in charge of developing the new Alumni Fund plan that the Class should name a man to represent 1901 in the drive for the Fund, Holmes, Seaver, Taft, and our former Secretary, Bob Williams, had a meeting in Boston and induced John McGann to take the job. Your Secretary therefore hopes that John will presently report as to results accomplished for this most worthy cause.

We have also learned that on Alumni Day last June, Bob Williams had charge of a most interesting exhibit for his company, the Submarine Signal Company, in Rogers Building at M.I.T. This exhibit included two fathometers, one of the standard type such as is used on steamers for navigating, and the other a new type which Bob stated has recently been made for the Coast and Geodetic Survey. The new type has a moving strip of paper on which the depth of water is automatically recorded as the boat moves along. With a boat making ten knots, an echo is recorded every nine inches along the course. Bob stated that the accuracy is good to 1 per cent so that for a twenty-foot depth the maximum error would be less than two and one-half inches. Apparently Bob's demonstration aroused much interest and gave him an opportunity to meet many of his old friends.

According to the November Review, Will Ghost Kelley (addition of "Ghost" being necessary to distinguish that gentleman from another classmate named Wingate of the same clan) recently had published an article of his, entitled, "Beating Black-Outs," in the June edition of the *Allis-Chalmers Electrical Review*. This sounds interesting and should be worth reviewing.

The September 17 edition of the Chicago *Herald-American* included an item regarding a special award to be known as the Florsheim Award, established at the Art Institute as a memorial to Bertha Aberle Florsheim by her husband, our classmate Leonard Florsheim. Incidentally, the newspaper item especially noted that their younger son Richard is making a name for himself as a painter, the older son Leonard, Jr., having taken up engineering at M.I.T. and now being in business in Chicago.

One change of address requires recording, that of Arthur C. Jewett who is now located at 224 East Court Street, Flint, Mich. — ROGER W. WIGHT, *Secretary*, The Travelers Fire Insurance Company, Chapman Building, Portland, Maine. WILLARD W. DOW, C.P.A., *Assistant Secretary*, 20 Beacon Street, Boston, Mass.

1902

Robbie has again migrated to New York City, and his address will be 105 East 38th Street until he returns home in the spring. — Clyde and Mrs. Place celebrated the thirty-fifth anniversary of their wedding on September 18. They have two daughters, Perry and Ann. Perry is married to E. C. Nickerson, 2d, of Cohasset, Mass., and Ann to R. A. Mason of Houston, Texas. The Nickersons have a daughter, Wendy, born on May 28, 1938; the Masons have a son, born on July 13. John F., Clyde's only

1902 Continued

son, is now a sophomore in Williams College and is a member of the college flying corps. The Places live in New York City during the winter and spend their summers on Cape Cod at Chatham. Clyde has been in the engineering business in New York City since graduation. One of the largest projects on which he was consulting engineer has been the Rockefeller Center, started in July, 1930, and now practically completed.

News has been received from Mrs. Nash of the death of our classmate, Arthur E. Nash, who passed away at his home in Philadelphia on October 29 after a brief illness. At the time of his death he was treasurer and vice-president of the Alcorn Combustion Company, Philadelphia. He and James Alcorn formed the company seventeen years ago and had been partners ever since. Mr. Alcorn passed away very suddenly just one week after Nash's death. Nash had formerly been vice-president of the Philadelphia Rubber Works Company, and during the World War was in the development department of the Du Pont company in Wilmington, Del. Besides his wife he leaves two daughters, Dr. Karleen Alden Nash of Philadelphia and Mrs. Thomas E. King of Wilmette, Ill.

Chester H. Wells, XI, died on July 25 in Lawrence, Mass., where for many years he had been running the Lawrence Storage Warehouse. After leaving Technology Wells was for two years with the Bureau of Filtration in Philadelphia. In 1904 he became health officer of Montclair, N.J., and helped that progressive community advance rapidly in its program of public health. Wells helped to establish the right of any community in the state to require that its milk supply be either pasteurized or come from tuberculin-tested cows, a right which in 1911 was of far-reaching importance. He remained in Montclair until 1918, when he left to become state commissioner of health in Delaware, where he remained until 1923 when he gave up his professional work. Wells's son, Neal, attended Tech with the Class of '29. — BURTON G. PHILBRICK, *Secretary*, 246 Stuart Street, Boston, Mass.

1903

Last summer when your Assistant Secretary was on Cape Cod he encountered two other members of the Class. Mellen C. M. Hatch is the author of an entertaining book about Provincetown and Truro. His book deals with the early history of these two towns and brings out many interesting stories of places, events, and people. Tom Sears picked up Hatch and Cushman in Wellfleet and took us all over that town, showing us his very attractive summer place, the Country Club, and the Yacht Club where he is just finishing his second term as commodore.

Other members of the Class appearing in the news are Richard C. Tolman, California Institute of Technology, and Frank B. Jewett, Bell Telephone Laboratories, both of whom have been appointed to the National Defense Research Committee, of which Vannevar Bush '16 is chairman. — Ancona, Lounsbury, and Morse are Honorary Secretaries of the Rochester, N.Y., Duluth, Minn., and Indianapolis, Ind., districts respectively. George Greene is Class Agent for the Alumni Fund. — Myron Clark spoke at the fourth annual Industrial Relations conference, November 8 and 9, at Stillwater, Okla.

We have been asked for addresses of missing classmates. Please communicate with your Secretaries if you have recent knowledge of Ralph E. Carlisle, VI, Frank H. Lacey, V, Adolph E. Place, I, Mary R. Pope, V, Josiah E. Reid, II, Otto L. Roehr, XIII, Charles J. Smith, VI, or Mary E. Warner, IV. — We hope you have a pleasant holiday season and a New Year which will turn out pleasanter and happier than it promises to be at present. — FREDERIC A. EUSTIS, *Secretary*, 131 State Street, Boston, Mass. JAMES A. CUSHMAN, *Assistant Secretary*, 441 Stuart Street, Boston, Mass.

1907

From the New York *Times* of November 10 we quote: "Allan R. Cullimore, president of Newark (N.J.) College of Engineering, has been named adviser in North Jersey for the government's program for training technicians for defense work, according to an announcement by A. A. Potter, consultant to the United States office of Education. Mr. Cullimore has been assigned to coordinate the program at Newark College of Engineering, Princeton, Rutgers, and Stevens Institute of Technology. He will also join with other region advisers in insuring that institutions with the best facilities are utilized for engineering defense training. . . . One of Mr. Cullimore's tasks is to maintain continual contact with defense industries, Army and Navy district offices, employment services, and other sources of information on personnel needs." — Ed Moreland, Dean of Engineering at the Institute, has been appointed to a position apparently similar to that occupied by Cullimore, according to the Boston *Herald* of November 23. Ed is regional adviser on the engineering defense training co-operative program of courses sponsored by the Institute, Harvard, Northeastern College of Engineering, and Tufts School of Engineering. Ed's section — region one — covers all of Maine, New Hampshire, Vermont, and Massachusetts.

I am sorry to announce that Harold Wonson, our Class Treasurer and Assistant Secretary and my warm personal friend for thirty-seven years, had a severe heart attack on September 28 and has had to spend about ten weeks in bed. He is under doctor's orders to take things easy for several months. Inasmuch as Harold, our class representative on the Alumni Council, is unable to attend the Council meetings this winter, I have appointed (with the approval of Charles E. Locke '96, Alumni Association Secretary) Octavus L. Peabody to pinch hit for Harold. Peabo's attendance will be credited to our Class as if Harold were present.

Herbert G. Spear, whose first wife died in 1936, was married again on February 26, 1938, to Frances E. Hodgdon, a graduate nurse from a New York hospital; and here is *real* news: Herbert has a daughter seventeen *months* old. Mary Louise was born on August 3, 1939. It is probably a safe and accurate statement to say that no other '07 man has so young a child. Our congratulations to the parents and to the little lady! Herbert has been successively, from 1907 to 1939, chemical engineer, department head, and sulphite superintendent at the Cascade Mill in Berlin, N.H., for Brown Company, a $40,000,000 pulp and paper concern with plants at Berlin and at La-Tuque, Quebec. On September 14, 1939, a sudden change in the management was made, and Herbert was asked to take over both mills in the pulp division. Last August a new line-up was made at each mill, and Herbert became business manager of the pulp division. He writes that he has had little time to do anything in patent, writing, or research lines, as operating and managing have required all of his attention. He is a member of the local city planning board.

It is a satisfaction to me to record the facts regarding L. Pomeroy Russell, VI, from whom I had never before heard directly. After graduation he went on a transmission-line construction job with the Central Colorado Power Company. After three months, however, his father, who had a woolen mill in Pittsfield, Mass., and some other interests as well, wanted him to return to Pittsfield and help operate the mill. He did return, and also worked into some of his father's real estate interests until 1914; then he was a farmer for twelve years. In 1926 Russell became associated with W. E. Barrett in a real estate business in Westchester County, N.Y. From 1929, he has been a real estate broker with George Howe, Inc., 527 Fifth Avenue, New York City, specializing in suburban properties in Westchester County and western Connecticut. Pomeroy married in 1909, and has a son twenty-one years old and a daughter nineteen. The family home address is 1 Garrett Place, Bronxville, N.Y. For some time prior to October, Russell lived in Scarsdale, N.Y., which is also the home of Harry Moody.

I wrote to Harry suggesting that he call on our classmate. A letter, dated November 1, from Harry says that he found that Russell had not only been his neighbor in Scarsdale, but also that his office is just around the corner from his own in New York City. Harry and Pomeroy spent about an hour together, and Harry did a good job in speaking for class interest and co-operation. Harry himself is still engineer and associate manager with Stevenson, Jordan and Harrison, management engineers, and he writes: "For the past year and a half my headquarters have been at our New York office (19 West 44th Street) rather than at our Cleveland office, although I still travel a great deal. . . . My son Bob '34 is still with General Motors Export Corporation and is now located at their

1907 Continued

São Paulo plant in Brazil, having gone there early last August. When I take my winter vacation it is possible that his mother and I may go there for a visit."

It was good to receive a nice letter from Chester M. Butler, V. He has consistently followed his chosen profession of chemistry, having been chemist with Glens Falls Portland Cement Company from 1907 to 1915, chief chemist for Alsen Portland Cement Company, Alsen, N.Y., for three years, and since 1918, chief chemist with Marquette Cement Manufacturing Company at La Salle, Ill. Chester and his wife live at 805 Wright Street, La Salle. Their twenty-five-year-old daughter is married to Carl H. Larsen and lives in Rochester, N.Y.

Henry C. McRae is still in Bartow, Fla., but his mail address is Route 1, Box 340. The room number in the Du Pont Building in Wilmington, Del., where Frank MacGregor has his office is now 3050. — In the November *Fortune*, in connection with an article entitled "Canada at War," appears an excellent cut of Clarence Howe, bearing the caption, " . . . runs Munitions and Supply, the agency that is committing itself to $600 million worth of war contracts. Many $1-a-year men work for Howe." BRYANT NICHOLS, *Secretary*, 126 Charles Street, Auburndale, Mass. HAROLD S. WONSON, *Assistant Secretary*, Commonwealth Shoe and Leather Company, Whitman, Mass.

1909

We wish all members of the Class a very happy and prosperous New Year. — The Boston group has lost our President, Carl Gram, who has moved to Lancaster, Pa. We shall miss him at our local meetings, but will look forward to at least an occasional visit when he comes to Boston for business. We wish you the best of luck, Carl, in your new undertaking!

Carl's own story may be of interest: "I, of course, read with interest the recent item in The Review in which you mentioned our daughter's wedding, and I now have some more real hot news regarding myself and the family. After being with the E. B. Badger and Sons Company for twenty-two years (except for the year and a half when I withdrew in 1926 to go with Lancaster Iron Works, at Lancaster, Pa., and whence the Badger company induced me to return), I have now resigned from the Badger company, and on December 1 again joined the Lancaster Iron Works.

"In the heart of the lovely Pennsylvania Dutch district, I bought a farm upon which is raised tobacco, wheat, barley, corn, sheep, steers, and so on, and we hope to try some new crops to help enlarge the family exchequer. In addition to the large tobacco barn and other buildings there is a fine trout brook flowing right by a very substantial old Colonial stone house. The house contains, plus usual things, hand-carved mantels over the fireplaces, beautifully carved corner cupboards, and the like. The item in the Lancaster paper announcing the real estate transaction stated among other things: 'Upon the farm is a stone house erected in 1814 by a family by the name of Neff, who moved decades ago by covered wagon to Salt Lake City and affiliated with the Mormon Church.' I do not expect to follow my early predecessors, but we do hope to continue to have a productive farm and an interesting home. The property also includes desirable woodland which offers excellent cover for game, but I hope to use the camera more than the gun in connection therewith.

"After jumping around and leading the family over two continents during the last five years, it will be a welcome change to settle down in such an attractive and interesting location as Lancaster County, but further than this my new business connections will, for a time at least, require my traveling about in search of new business. I hope to get together occasionally in New York with Paul Wiswall and his gang, and in any other centers where there are enough '09 men to congregate. I expect to continue attending the Alumni Council meetings in Boston, for the time being at least, and will probably continue to serve as Class Agent for the M.I.T. Alumni Fund, particularly as there will be no great activity again until next spring or summer.

"The annual report will list all those who have made direct contributions to the Fund. I have had considerable discussion over the past few months with the Fund board because no provisions had been made for including on the list, or crediting in the class percentages, the names of those members of our Class who have, for several years, been carrying insurance policies payable to the Institute, the annual premiums for which amount to considerably more than the average donations to the Fund. I am now pleased to report that the Fund has agreed to include in its annual report not only those who have contributed to the Fund this year, but also those who are carrying these insurance policies, amounting to a total of $33,901.07, payable to the Institute. The following members have such policies: Philip H. Chase, Henry C. Colson, Jr., Hardy M. Cook, James H. Critchett, Chester L. Dawes, Ridsdale Ellis, Robert C. Glancy, Carl W. Gram, John M. Hatton, Reginald L. Jones, William H. Jones, William J. Kelly, Francis M. Loud, Charles R. Main, John Mills, Edward L. Ryerson, Jr., Maurice R. Scharff, Arthur L. Shaw, Harry P. Trevithick, George E. Wallis, Harry E. Whitaker, Paul M. Wiswall, and Ira W. Wolfner.

"Certain other members also took out policies or assigned already existing policies to the Institute but continued to hold them themselves, and we have no record of the face value of such policies. These members are: James I. Finnie, George H. Gray, Franklin L. Hunt, Lewis H. Johnson, Frederick J. King, Harold L. Lang, John W. Nickerson, F. Gardiner Perry, George T. Southgate, and Theodore F. Stark. — Instead of taking out an insurance policy, Henry K. Spencer donated a lump sum, and Thomas C. Desmond has made a special provision in his will for the 1909 Scholarship Fund. These amounts are included in the total amount mentioned. This Fund stipulates that the income is to be available for scholarship aid with preferences to direct descendants of members of '09.

"There may have been other class members, who contributed varying amounts instead of taking out insurance policies, whose names are not listed because of your Class Agent's lack of information. If, at any time, other members of the Class would like to join the 1909 Scholarship Fund, it is suggested that you apply to your Secretary or your Class Agent for further information. Your participation is strongly urged."

Paul Wiswall reports that the only news that he has for The Review is word from Bob Doane that he is about to come back to his old job with the Anaconda Wire and Cable Company at Hastings-on-Hudson, and that he will now be able to come to our class luncheons in New York.

On October 31 the Class lost one of its eminent research mathematicians, John R. Carson, who was associated with us during the junior year. He was graduated from Princeton in 1907 and received his degree of master of science there in 1912. He was an instructor in physics and electrical engineering at Princeton, and an engineer in the transmission department of the Westinghouse Electric and Manufacturing Company before joining the American Telephone and Telegraph Company as transmission theory engineer. As an engineer for the telephone company Dr. Carson took an active part from 1914 to 1920 in early radio-telephone experiments. In 1917 he installed the first carrier-current system, between Pittsburgh and Baltimore, by which several telephone calls could be transmitted through a single electrical circuit. This invention of Dr. Carson's is responsible now for 250,000 miles of carrier-current wires. He also developed the mathematical background for the use of metal pipes to guide radio waves. In 1934 he transferred from the American Telephone and Telegraph Company to its affiliate, the Bell Telephone Laboratories. In 1924 he received the Liebmann Memorial prize from the Institute of Radio Engineers. In 1935 the Brooklyn Polytechnic Institute awarded him a doctor of science degree, and in 1939 he won the Elliott Cresson medal from the Franklin Institute of Philadelphia. Surviving him are his widow, Frances Atwell Carson; a son, John R. Carson, Jr.; and a brother, Robb Carson, of Los Angeles.

The New York *Herald-Tribune* of October 31 reported that the Inland Steel Company, Chicago, of which Ed Ryerson, Jr., is chairman of the board of directors, expected to reach an all-time high rate of production this fall.

The publication of a new book by Molly Scharff has been announced: "The problem of depreciation is nowhere more comprehensively treated and clearly demonstrated than in the latest study of

1909 Continued

Mr. Maurice R. Scharff, Consulting Engineer to several large utilities, 'Depreciation of Public Utility Property'. He and his collaborators, as the result of a decade of study and work in this field, recognizing the importance of the shift from the old to the new requirements for depreciation accounting and for complying with regulation, have been able to clarify the basic assumptions underlying various depreciation methods. The 'straight-line' and 'estimated actual' depreciation methods are compared and discussed in detail and their relative merits and weaknesses thoroughly described." — CHARLES R. MAIN, *Secretary*, 201 Devonshire Street, Boston, Mass. *Assistant Secretaries:* PAUL M. WISWALL, MAURICE R. SCHARFF, New York; GEORGE E. WALLIS, Chicago.

1910

Dan Gibbs stopped at the office recently and advised me that he is the father of another son. This addition brings Dan's family to a total of eight — five girls and three boys. — Dick Jacobs, who has been a captain in the Army and who lived in Waban, has been promoted to the rank of major. He now resides at 3507 Idaho Avenue, Northwest, Washington, D. C. — Dud Clapp has bought a farm in Peterborough, N.H., and he is now building a house where he can vacation during the summer and spend many week ends.

The Boston *Post* of Friday, November 22, refers to the "Five Centuries of Printing" exhibit and banquet, the high points of Printing Week, which opened at the Hotel Statler on November 21: "Douglas C. McMurtrie, typographic director of the Ludlow Typograph Company of Chicago, one of the best known men in the printing industry and acknowledged to be the world's foremost authority on the life of Gutenberg, gave one of the principal addresses. He told of incidents in the life of the inventor of printing." — HERBERT S. CLEVERDON, *Secretary*, 46 Cornhill, Boston, Mass.

1911

The event of November was the formal inauguration on the nineteenth of Carl Stephens Ell, XI, as president of Northeastern University, Boston, succeeding the founder and first president of the University, Frank P. Speare. Dr. Speare is the William Barton Rogers of Northeastern, having founded that University in 1898. For the past thirty years — ever since joining us in our junior year after receiving his A.B. from DePauw University — Carl has been associated with Dr. Speare in the work and development of the University. Ell has served successively as assistant, instructor, assistant dean, dean, and vice-president. In choosing Carl the second president of the University, the Trustees have paid him a deserved tribute.

To me one of the finest things Carl expressed in his inaugural address and reiterated at the banquet was his threefold conception of what the co-operative educational institution should strive to instill in its students: culture, personality, and vocational adequacy. He said: "A democracy cannot afford to waste brains and ability through lack of opportunity, and an institution such as Northeastern is designed especially to meet the needs of that large group of youth who possess ability and ambition but who are limited by lack of adequate financial resources." Mrs. Denison and I attended both the inauguration and banquet. Also at the banquet were John Herlihy, Mr. and Mrs. Thomas H. Haines, and Mr. and Mrs. Oswald W. Stewart as an '11 delegation to greet Carl and his wife.

Our Seven Come Eleven party at Walker Memorial on the evening of November 7 was an unqualified success with twenty-six of us present! It was sponsored by Dennie and Jack as usual. Here is the list of those present in addition to Jack Herlihy and your Secretary: E. J. Batty, II, Obie Clark, II, Marshall Comstock, VI, George Cowee, III, Art Coupal, II, George Cumings, VI, Alf deForest, XIII, Sterling Dyer, II, Bill Fortune, I, Tom Haines, II, Stan Hartshorn, X, Charlie Linehan, I, Ray Lord, VI, Roger Loud, VI, Maurice Lowenberg, VI, Roy MacPherson, II, Fat Merrill, I, Walter Phillips, VI, Bog Stevens, IV, Oswald W. Stewart, I, Ted VanTassel, Jr., X, Emmons Whitcomb, X, Gordon Wilkes, II, and Alec Yereance, I. With so many present we spent more time than usual on the "talk-around," and most interesting it was! Obie Clark said he had run into Dippy Allen, II, in Washington some time ago and was intrigued to learn that he and his family are living on a yacht in the Potomac River all the year 'round. Dippy is in the engineering department of the Washington Gas Light Company, you know. The Allens have a boy in Cornell University and a girl working in the United States Library of Congress, Clarkie added.

George Cowee apologized for having failed to attend class functions up to this time, but said he got away to a bad start by going so far away from Boston on mining jobs in Canada and in Mexico, and that since coming back to Boston twenty-two years ago he had never picked up where he left off. From now on he expects to be a 100 per cent attender. He has been with the Liberty Mutual Insurance Company in Boston for two decades and is now a vice-president of the company. He and his wife have two married children — a boy, Yale '34, and a girl, Smith '36. The latter has a son, so George is now Gramp Cowee! — At this point Alf deForest piped up that he is a grandfather; and, not to be outdone, Ted Van Tassel said he is twice a grandfather. Alf added that the Magnaflux Company, of which he is president (he is also a professor at the Institute), is now making practical use of a new principle of measuring strains by means of metal coatings.

Sterling Dyer said he has a son in the sophomore class at Lehigh University. Stan Hartshorn's wife accompanied him from Gardner, but she stopped at Harvard Square to have dinner with their daughter, who is a senior at Radcliffe. O. W. Stewart said his second son, Amherst '40, is now taking a postgraduate course at Technology, while Roger Loud's older boy is now a junior at M.I.T., and Ray Lord's son, a sophomore. — Walter Phillips, like George Cowee, present for the first time at a class affair, said he didn't have the distance alibi. He has been right around Boston for many years with the New England Telephone and Telegraph Company. His youngest boy is a senior in architecture at M.I.T.; his second son was graduated from Harvard Dental School last June; and his oldest boy was graduated from Boston University in 1936 and is now practising law. Alec Yereance has a daughter who is a senior at Smith; and O. B. Denison, Jr., is a senior at Bowdoin this year. Jack Herlihy's oldest boy, John '39, is in Chicago with the Inland Steel Company. Jack has two younger children still in college.

Ted VanTassel, who in the talk-around had announced that he is New England manager for R. M. Hollingshead Co. of Camden, N.J., manufacturers of compounds, dressings, polishes, and so on, took over the meeting at this point to discuss the thirty-year reunion, scheduled for June 6 to 9, 1941. He is chairman. He announced the following committee: O. W. Stewart, Emmons Whitcomb, Dennie, and Jack. Ted announced as regional chairmen: Stan Hartshorn, X, Gardner, Mass.; Zeke Williams, XI, New York City; Don Stevens, II, Passaic, N.J.; Ted Parker, I, Knoxville, Tenn.; Pete White, II, Beaver Falls, Pa.; Burgess Darrow, VI, Akron, Ohio; Lloyd Cooley, X, Chicago, Ill., and Paul Kellogg, IX, Montreal, P.Q., Canada.

Ted said that the general committee felt that since we have had our best attendance records at the Mayflower Hotel, Manomet Point, Plymouth, Mass., the Mayflower seems to be the logical place to go. The group present unanimously agreed to this reasoning. Ted said that an analysis of a card list supplied him by the Alumni Office showed 382 members for whom we have reliable addresses. This fact convinces him that with intensive work by the regional chairmen, we can pass the hundred mark in attendance this coming year. He concluded with the thought that we would have one big dinner, probably on Saturday night, which all would be urged to attend.

Our speaker of the evening was our own classmate, C. H. Sayre Merrill, who gave us a wonderful talk on the Gill-Merrill expedition to Ecuador in search of the drug, curare, which is becoming such a boon to humanity through its development as a curative process for spastic paralysis. — The usual bowling concluded the evening's entertainment, and curiously enough Ernest Batty was holder of scores for both the lowest and highest strings rolled. He rolled a puny 61 and, determined to retrieve his prowess, went right to work and rolled a thrilling 96 — very good for candlepins. George Cumings also broke 90, rolling a 92, while Art Coupal and Ray Lord each had an 85, and O. W. Stewart hit 84. All the other scores were in the 70's.

1911 Continued

Just before I left Walker Memorial that evening, my attention was called to one of the bulletin boards on which a poster announced that Monk de Florez, II, of New York City, would give a talk in the placement training series for seniors and graduate students on Friday, November 8. Commander de Florez, it stated, would speak on "Non-Flying Opportunities in the Air Corps." — Henry Dolliver, I, with Jackson and Moreland, engineers in Boston, wrote: "I'm still working in Pennsylvania (care of L. C. Pursell, Pennsylvania Power and Light Company, Allentown) and will probably have to be here for another three or four months." Cal Eldred, VI, said he was sorry to miss this dinner, but "a previous engagement that cannot be changed makes it impossible to come." Carl Ell was similarly deterred, and Morris Omansky, V, wrote on his card of regret: "I'm giving a new University Extension course this year at M.I.T. and am busy with development, research, and litigation. I'm also repeating one of last year's series on a more expanded scale." — A card from Mrs. C. R. Johnson advised us that Cleon, X, for years in the Boston area, is now located at 121 East Fourth Street, Hinsdale, Ill., but no reply has yet been received to my request for more information.

On its business and finance page in a late October issue, the Baltimore evening *Sun* had an interesting illustrated article, entitled, "81 Years: Horse-Car to Trackless Trolley," featuring the development of the Baltimore Transit Company, founded on July 26, 1859 and headed by Bancroft Hill, I. Stating that "unparalleled in the past history of transit service in Baltimore, the present company finances its modernization in cash," the article quotes President Hill as saying in his annual report to stockholders: "If money enough is not set aside out of each year's revenue to replace what wears out and particularly what becomes obsolete, the whole city will suffer — riders and non-riders alike — because a good modern transportation system is an absolute necessity to every large city." It's surely refreshing, Ban, to see such a practical application of the pay-as-you-go policy. I also like your statement: "The city traffic problem is not one of moving vehicles, but of transporting people. To handle the same number of people in autos as the public vehicles carry would take three times as many streets."

Jack and I wish to extend to each and every one of you our sincere wishes for a very Happy and Prosperous New Year, and we hope to see you *all* at the thirtieth reunion during the first week end in June, 1941. — ORVILLE B. DENISON, *Secretary*, Chamber of Commerce, Worcester, Mass. JOHN A. HERLIHY, *Assistant Secretary*, 588 Riverside Avenue, Medford, Mass.

1912

Leon A. Salinger is now located at the United States Appraiser Stores, United States Food Inspection Station, San Francisco, Calif. — The Alumni Office has lost track of Herbert S. Cummings, whose last address was 104 Sharon Street, West Medford, Mass. Can anyone give us his present location? — Horace Fay, patent attorney of Cleveland, has announced the reorganization of his firm which is known as Fay, Macklin, Golrick and Williams, located in the Leader Building, Cleveland, Ohio.

Word has been received of the engagement of Elizabeth Jane Bent, daughter of the late Donald Bent of Denver, Colo. — The Boston papers recently carried the announcement of the marraige of Constance Barry, daughter of John Lincoln Barry of Hingham, to William A. Lydgate. They are making their home in New York after a wedding trip to Nova Scotia. — Jabez H. Pratt's son Ryder, who was graduated from the Institute in 1939, has announced his marriage to Elizabeth Kittredge of Oak Park, Ill.

If anyone reading these notes can give us any information about Lea Albert Weatherwax, IV, it will be greatly appreciated. We have a letter from J. Howard Cather, IV, who relates that Weatherwax and he were close friends at the Institute, and that the friendship was kept up for many years afterward by correspondence and occasional visits until about five years ago. "About 1935," writes Cather, "I received a letter from him saying that he had been employed by the Mexican Government to undertake engineering work in connection with certain dams and other heavy construction. This was the last I heard from him. . . . We never before failed to send each other cards at least on Christmas. . . . In the register (the one Page Golsan sends out) the name of Lea Albert Weatherwax . . . is included without address. . . . As far as I know he had no close relatives except a mother, who the last I heard lived in Los Angeles. Possibly some member of the Class living in or visiting that city might be able to locate Weatherwax."

As for Cather's own story, we elicited a note from him: "As head of the power department of Kodak Park, which is the parent plant of the various ones of Eastman Kodak Company, I have charge of most of the consulting and engineering work for changes in the power equipment of the other plants. As you may imagine, there have not been many inquiries from the French or German plants for some time. I suppose my old friends in the architectural course, structural option, will wonder how I happened to be a mechanical engineer all these years. The depression preceding the World War started it, but that's a long story. True to the tradition of many Tech men, I married a Wellesley graduate and lived happily ever after. I have not seen any of my old Tech buddies for years, and if any of them ever happen to pass this way I would certainly like to supply them with a meal. I hope one of these days to arrange things so that I can attend a '12 reunion."

Juan Metamoros of San José, Costa Rica, has been on a visit to the United States as the engineering representative of that country in connection with the loan the United States is advancing to Costa Rica to put through its part of the great intercontinental highway which when completed will be a through route from Canada to South America. As we understand it, Juan, with his United States education in civil engineering (M.I.T. and Lehigh University), is a sort of liaison engineer representing the interests of both governments. During a brief visit in New York with your Assistant Secretary he promised to write us about all this in greater detail. So we hope to give you, at a later date, more accurate news of this very interesting project. — FREDERICK J. SHEPARD, JR., *Secretary*, 125 Walnut Street, Watertown, Mass. DAVID J. MCGRATH, *Assistant Secretary*, McGraw-Hill Publishing Company, Inc., 330 West 42d Street, New York, N.Y.

1913

If you went to the New York World's Fair maybe you stumbled over one or more of the three thousand lockers placed there by Bill Mattson's American Locker Company. Bill, I, is a born extracurricular hound, and this fall he entered politics. Bill and Mabel were delegates to the Massachusetts Republican convention. They ran the Willkie headquarters at Newton, Mass., and that town voted two to one for Willkie. Bill's daughter, Janet, is a sophomore at Mount Holyoke. — Joe Strachan, I, has moved to Pittsburgh from New Jersey, where he worked for Congoleum-Nairn, Inc. Joe always has a comeback. At our twenty-fifth reunion I said, "Joe, I suppose you are still mixing ground cork and linseed oil to make housewives happy." Right back, with a soft rising inflection, came: "Yes, Fred, with a modicum of brains." Joe is now assistant to the chief engineer of Carnegie-Illinois Steel Corporation. It is thrilling to learn that such a whale of a customer found out what better mousetraps Joe has been quietly making. — George Bakeman, XI, has left Paris, France, and is with the Rockefeller Foundation in New York. Walter Muther, I, has moved from Boston to Norwell, Mass.

Thanks, Bill Ready, for this nice letter: "Our boys (including myself) are strange animals. They remind me of a geyser that I saw in Yellowstone Park — not Old Faithful, for you can predict Old Faithful's behavior for years to come — but an unpredictable geyser. It slumbers along for an indeterminate period, then all of a sudden it awakes as if it had been hailed by a voluptuous blonde and, wow, what an eruption! That, in a nutshell, is our Class. They'll always come through, but they need a panzer division to get 'em started.

"Since seeing you in June we have had a busy summer. My boy, Bill, did his bit at an army camp. Then he married Janet Smith, and ended up working for the Crucible Steel Company of America. And we, with maternal and paternal duty, followed him around most of the summer (except on his honeymoon). Fort Belvoir, Va., where Bill did his tour was a very busy place. Boys from all over the country were there, and a very earnest bunch they were — all willing and anxious to learn and all seemingly sure that we were

1913 Continued

in for trouble. We saw the new Garand rifle in action, and believe me it was impressive. The Johnson rifle may be better, but the Garand will certainly throw a lot of lead and is not bad on accuracy. I got a glimpse of Charlie Edison. He is a very busy man and is well liked in Washington. Here is where I make a prediction: he will be the next Democratic candidate for President, and he will be hard to beat. But then, I had better stay away from politics and not go any further out on a limb.

"I haven't seen many of the old gang lately but did have a nice visit with Larry and Bun Hart in Bronxville, N.Y., last spring. Larry gave us an exhibition memory test that would have even Houdini worried, or was it Thurston? Really he is tops at it. I had a nice note from Hap Peck. His son, Robert, entered the Institute this fall. He is a swell kid. I know: I played golf with him. I see Jo MacKinnon quite often — just as baldheaded and busy as ever; and I also see Al Townsend and Charlie Thompson at council meetings, and occasionally Bill Mattson. Bill doesn't change much, just a little healthier looking. I saw Jo Cohen at the New England Industries dinner. Jo has been dieting and looks a lot better.

"The Class has another granddaughter, Jacqueline Baine. She is about sixteen months old now, and is a pretty good chip off the old block. She is the class baby's second daughter. — My health has improved appreciably, but I still know my limitations, and they are definite. — And while I'm at it, all of you lads who think that you are as young at fifty as you were at twenty, pause and ponder before you overtax your pump. I'd much rather see your notes in The Review than in the local obituary page. — Well, there's the granddaughter calling, and I must call it a day." — FREDERICK D. MURDOCK, *Secretary*, Murdock Webbing Company, Box 784, Pawtucket, R.I.

1914

Charlie Fiske has tentatively selected Tuesday, February 4, for a New York get-together dinner. When final plans have been completed, notices will be sent to those in greater New York and to any others who desire to receive them. Just drop Charlie or your Secretary a card letting us know that you would like to receive the dinner notice.

Dunc Shaw has been on the move again. Ever onward, ever upward! On November 12 he left Fitchburg, Mass., where he had been sales manager of the Lockwood Hardware Manufacturing Company, to go to Reading, Pa., to take over the presidency of the Reading Hardware Corporation. How many '14 men in bygone days have pushed Reading lawn mowers? Perhaps some still do. — While we are on the progress theme, we should note that Homer Calver, having about completed his activities associated with the New York World's Fair, is very busy arranging for the opening of the new American Museum of Health, Inc. Homer is secretary of the museum organization and for the past two years has been actively engaged with the health exhibits at the World's Fair. The Museum has acquired the building formerly known as the Masterpieces of Art Building and is remodeling it to make it more suitable for museum purposes. Homer expects to have the new exhibition open to the public sometime this spring.

Comes fall, comes Dean Fales. Dean disappears for the summer, but when the frost is on the pumpkin he heads for his warm office and, just by the way of letting people know he is back, opens the season each year by addressing the New England section of the Society of Automotive Engineers, Inc., on "Trends in New Automobile Designs." This year the premier took place on November 12. Dean is a member of the National Council of Automotive Engineers. — Chatfield was in Boston recently attending a meeting of the new products committee of the New England Council. Dinny reports that his activities at the United Aircraft plant are keeping him so busy that the few remaining hairs on his head are rapidly disappearing. — Art Peaslee, who represents the Technology Club of Hartford, Conn., on the Alumni Council, gets up to Cambridge from time to time, and with your Secretary endeavors to keep alive the activities of the Class.

Laurels to Ray Dinsmore! At the June commencement of the Case School of Applied Science in Cleveland an honorary degree of doctor of engineering was conferred on him by President Wickenden. Many of you will recall President Wickenden as a professor of electrical engineering at the Institute during our undergraduate days. The citation reads: "Ray Putnam Dinsmore — we recognize in you one of the succession of pioneers who have created a great industry and are making for it an even greater future, a man of research and a man of affairs, an internationalist uniquely equipped to serve your country, a man who sees in science the foundations for a more secure peace."

Dinsmore has recently been doing quite a bit of writing and speaking. He was the Sigma Xi speaker at commencement at Case, and in September he spoke at the National Farm Chemergic conference meeting on synthetic rubber. On the same program was Clarke Atwood, who spoke on synthetic products from milk. By way of demonstration Atwood wore a suit made from milk and provided samples of sauterne wine also made from skim milk. About a decade ago Ernest Crocker's chemistry was very helpful to '14 men; now with imports from France cut off, Atwood comes to the rescue. Classmates will also be interested to know that there is a very great probability that the last hats they bought had some of Atwood's R-53 fibers in them. This, too, is a casein product and was developed in Atwood's laboratories, which are operated as a subsidiary of National Dairy Products Corporation.

After over four months of serious illness George Whitwell is again back in his office as vice-president of the Philadelphia Electric Company. On July 3 he was forced to bed by a staphylococcic infection which ultimately got into the blood stream. George's ankles were the most seriously affected, and the tissues were damaged. After four months he was able to walk only with the greatest difficulty. For one as active as George, this is real trouble, and all '14 join in wishing him a speedy return to vigorous health. — Don Douglas continues to be written up almost daily from coast to coast. — H. B. RICHMOND, *Secretary*, General Radio Company, 30 State Street, Cambridge, Mass. CHARLES P. FISKE, *Assistant Secretary*, 1775 Broadway, New York, N.Y.

1915

At the convention of the American Association of Textile Chemists and Colorists in New York on October 17 there was a big Course X delegation including John Dalton, Ralph Hart, Ken King, Larry Landers, and Al Samson. It was a pleasure to see the boys again. — I recently had lunch in Boston with Archie Morrison, and in Lawrence with John Dalton; visits in Boston with Roland Baldrey and Reggie Foster from Lowell; an evening in Lowell with Chet and Mrs. Runels and their delightful family of three daughters; a visit at Loring Hayward's office in Taunton, Mass. Loring told me that Lloyd Chellman had given the principal address at the dedication of a bridge somewhere in New Hampshire. Loring had just been consulted on a civil engineering job that entailed using the thesis that he and Ed Bascom worked out together in 1915.

I advise any classmate in the neighborhood of Henry Sheils's house in Watertown, Mass., to drop in about dinnertime. Mrs. Sheils is famous for her roast turkey and roast beef. — San Willis is associated with the British Purchasing Commission in New York City, and is doing some investigating and purchasing work on their war requirements. — Don Perin is the designing engineer at the Hamilton Standard Propellers division of the United Aircraft Corporation in East Hartford. I have seen Don a couple of times and am looking forward to an evening with him, as he wants to discuss plans for our next reunion. — Bill Spencer, with the Consolidated Engineering Company, Inc., in Baltimore, Md., is busy on important government construction work. — Wayne Bradley sent me a letter written late in May by his old pal Johnny Kelleher, whom nobody has seen for a long time: "I spent a couple of months in New York last winter and only wish I had known that you were there. I would most certainly have made arrangements for the reunion. Had thought about it now and then, but figuring it would be a family affair and not stag, was not particularly interested. . . ."

On a check which Bob Warren generously sent me he wrote, "Pretty please — help Azel!" Thanks for the check, Bob, and also for the pretty sentiment. — Just after the reunion Elbridge Casselman wrote from Pittsburgh: "Never let it be said that running out of writing paper is all it takes to stop my correspondence. One reason we are out of paper is that

1915 Continued

of an unusual drain on the supply. A couple of weeks ago we announced the engagement of our daughter, and that is something in the way of excitement. I don't think you ever met her, although she has been with us in Boston once or twice. We old folks will be pretty much alone when she steps off. The main purpose of this letter is to tell you how very much we enjoyed the festivities of the twenty-fifth reunion and to congratulate you on the swell way you conducted it. If it kept you so busy that you didn't get much fun out of it yourself, you may rest assured that it was a high spot in the year for the rest of us. What a kick I got out of meeting that old gang again after all these years! And what a lot of pleasure it was for Mrs. Casselman to join in your well-arranged plans. . . . I received, of course, the photos of the party on the Cape and of the Course X group. The boys were a little more quiet than they were on the senior picnic when a similar photo was taken, and some of us ran around from one end to the other to get our pictures taken twice. We didn't tell so many stories at this banquet as we did at the senior banquet. But those that couldn't make it certainly missed something that I would not have given up for anything. Thanks for doing a swell job. Mrs. Casselman joins me in that. . . ."

We can't continue to write about the reunion without mentioning Henry Daley and giving him credit for the splendid work he and his gang did in Philadelphia. Henry's inimitable Celtic wit still gives me a great laugh: In answer to my request for pictures taken at the reunion to be added to our class gallery, Henry answered, "Sorry, I have no films or pictures of the reunion, but I have a beautiful picture of myself taken at the age of two." A little later he sent me one of Webster's cartoons from the New York *Herald Tribune* entitled "Life's Darkest Moment," in which "a dottering old gent of 45 listens to a baseball broadcast" which tells about a veteran baseball shortstop who has lost his stuff and zip as the ravages of time take their toll as he reaches the old age of thirty years. Henry's comment was, "Say it ain't so, Azel." I think Henry's funny, but I don't like to be reminded of these encroaching years. And then he wrote the following splendid letter: "I just wanted to let you know both Mrs. Daley and I think you did a swell job in putting over the twenty-fifth reunion as you did. I never in my life have experienced such an enjoyable occasion. The arrangements were perfect, the food delightful, and the gang all so congenial. Whether you knew a fellow in Technology or not made no difference — in two seconds he was a long-lost friend. You fellows who have been to former reunions missed something that we who had never been back before enjoyed — namely, meeting old, old friends. We here in Philly are planning to get together again, and we look forward to your joining us."

Peace, plenty, and happiness to you all is my New Year's wish. I hope in next month's notes to have the report of class dinners we plan to hold in Boston and New York. We are going to show the movies that Speed Swift has taken during the past five years. — Frankly, I have used up all the material that I had left from the reunion, so "Help Azel." — AZEL W. MACK, *Secretary*, 40 St. Paul Street, Brookline, Mass.

1916

Hen Shepard writes your Secretary as follows: "I have just returned from a trip to the West. In San Francisco I had a very pleasant telephone conversation with Paul Austin, but I did not have time to see him. Paul is associated with Jack Kellar in the Gasair Corporation. Jack looks after the selling end, and Paul concentrates on the design and manufacture of butane equipment. Paul said that he would certainly like to go to the twenty-fifth reunion, but he doubted if he could get away. In Houston I visited with Kem Dean. Kem is still in the cotton-brokerage business and reports that things are rather quiet now because of the cutting off of foreign markets. Kem is planning to be present at our twenty-fifth.

"I went to Andover to attend the annual alumni day at Phillips Academy. Whom should I see there but Duke Wellington of New Haven, Conn. Duke and I were both in the Class of '12 at Andover and '16 at Technology. He was as much concerned as usual with the responsibility of seeing that New Haven citizens get proper drinking water. He is making definite plans to be at the twenty-fifth and is looking forward to a notice about the time and place. — As usual I am very much on the jump. During the past six months I have been in forty-four of the forty-eight states, visiting all of our principal bowling-equipment distributors. In spite of my travels, however, I found time to improve my game of golf during the summer, and played in most of the matches of the twilight golf team at the Brae Burn Country Club."

The New York *Herald Tribune* of November 14 carried a two-column notice about Joe Barker's appointment to a defense training job: "Appointment of Dean Joseph W. Barker, of the Columbia University School of Engineering, as the United States Office of Education regional adviser for New York City and Long Island in a nation-wide program to train engineers for defense jobs, was announced yesterday at the university. Dr. Barker will be liaison officer between industry and education in the New York area, helping local engineering schools meet the increased demand of defense industries for technicians."

From I. B. McDaniel the following interesting communication has been received: "Al Lieber has been promoted to the rank of lieutenant colonel in the Army Engineers. He was head of the beach erosion board but now is with the big shots in Washington. The work he is doing is most confidential, but I assure you he has one of the most responsible positions in our national defense program. — Frank Hastie is now a major on active duty in the chief engineer's office. I haven't seen him, but Al says he looks great. — Dina Coleman is still in Lexington, Ky. He has bought Radium Springs (near Silver Springs, Ocala, Fla.) and is building a hotel, de luxe camps, and so forth. Radium Springs, according to Di, has everything, and Silver Springs will soon be forgotten. George Kittredge '17 is in charge of the work at Radium Springs.

"It is surprising how many classmates own boats and have that patriotic urge to give them (at their own prices) to the Navy. These classmates think that I can help. Of course I am glad to hear from them, but to date I have not been able to 'give' the Navy their boats. — I have really had my nose to the grindstone. We have just completed the new David Taylor Model Basin, and there is nothing like it in the world. My new address is David Taylor Model Basin, Bureau of Ships, Navy Department, Washington, D.C. If any classmates are down this way and desire to see the Navy's 'House of Magic' by all means have them contact me."

Ed Weissbach, II, who is superintendent of equipment at the Campbell Soup Company, Camden, N.J., calls our attention to an article in *Time* of November 4, which tells how John Ingle, II, head of Goodyear Rubber Company's crude rubber division, flew from Akron to Brazil to play golf with the head of the Brazilian Government and other dignitaries. Ed states: "This article about Johnny Ingle should be of particular interest to those of us who worked for Goodyear in Akron back in 1916–1917 — Jap Carr, Flip Fleming, Hal Gray, and Arvin Page. When I last heard of John Ingle he had gone to Singapore. Johnny could give you a real story concerning his experience." — How about a story for The Review, Johnny?

Charlie Reed, II, has been promoted to the rank of major and has moved from Springfield to Wilmington, Del., where he has a new important assignment. He says: "To aid concentration I need all the engineering I ever learned from beam design. We start with the mere idea that we want a powder plant somewhere and proceed to select the site, get it built, and get it operating — just as simple as that. I have a nineteen-year-old son, Charles, Jr., who won the top presidential appointment to West Point this year and is now at the Military Academy. My twin boys, Dobbie and Billie, are in high school here."

Your Secretary would welcome contributions to the Alumni Athletic Fund, which assists in financing the sports program at the Institute. Classmates should send contributions to Ralph T. Jope '26, Secretary, Room 3-219, M.I.T., Cambridge. This worthy cause merits the support of classmates interested in athletics. — By the time you read these notes you will have received notice of reunion dates, the place of meeting, and so forth. Your class officers, with Walt Binger, Ralph Fletcher, Steve Brophy, and a few others, are putting a lot of time and effort into plans for a convenient re-

1916 Continued

union in congenial surroundings. Classmates from the Pacific Coast and Texas have promised to be on hand. Let's make our twenty-fifth the one big enjoyable reunion to remember. — JAMES A. BURBANK, *Secretary*, The Travelers Insurance Company, Hartford, Conn. STEVEN R. BERKE, *Associate Secretary*, Coleman Brothers Corporation, 245 State Street, Boston, Mass.

1917

J. Worthen Proctor has been made commanding officer in charge of the Ogden Ordnance Depot at Ogden, Utah. Further inquiry has brought forth the fact that the Depot is slated to be about the largest of its kind in the country. — Jesse A. Rogers, Jr., recently advanced to the grade of lieutenant colonel, Ordnance Department, writes: "Last June, I received orders transferring me from the first corps area headquarters in Boston, Mass., to Edgewood Arsenal, Md., where I am ordnance officer. My work here in connection with members of the Chemical Warfare Service, who are engaged in the manufacture of chemical munitions, is proving most interesting in its latitude and connective problems."

News this month is scarce. The vacation collection was heaved into last month's Review and left an empty file. One note from the Boston *Traveler*, however, is still timely and concerns one of the several Annapolis men we are privileged to record as members of the Class: "Commander Forrest P. Sherman, newly appointed to the six-man U. S.-Canada defense board, is 44 years of age and a member of an extraordinary Melrose family of teachers and workers. At the age of 8, Sherman announced to his family that he intended to become an admiral when he grew up. He forswore baseball as a waste of time and concentrated his energies on mathematics, wireless and boats. . . . He stood at the head of his class of 1913 at Melrose High and again at Annapolis; and grew to be one of the foremost figures in the promotion of naval aviation. . . .

"The commander has been stationed at Washington, D.C., for a time in the Bureau of Naval Operations. He was in the Annapolis class which was commissioned early because of the U. S. entry into the first world war, having had a year at M.I.T. . . . During the war he was based at Gibraltar a good deal and after the armistice commanded a destroyer. At Pensacola, Fla., he became interested in aviation. . . . His later service was with the Lexington and the Ranger, both aircraft carriers; and as head of a squadron of 'dive bombers' he was the original of a character in the sensational movie 'Hell Divers'."

Ken Bell was good enough to send us a manuscript especially prepared for these notes detailing the 1940 peregrinations of the six Bells who "went on a tour this summer — my wife, myself, and our four children, Elizabeth, John, Phyllis, and Phoebe. The train was the only logical means of transportation, and we had a most comfortable time — 65,000 passenger miles, 500 person meals — details on request. The rest of the family journeyed to Chicago where I joined them on Friday, June 21. After two days on the Sante Fe we spent Sunday at Grand Canyon. Photography, a bus ride along the rim, and a hike down the Bright Angel Trail for a couple of miles filled a memorable day.

"The next four days were spent in and around Los Angeles and San Diego and included dinner and shopping at Tiajuana, Mexico, a visit to orange groves, the San Luis Capistrano Mission, Hollywood, an ostrich farm, and — most impressive of all — the Huntington Museum and Library. Then we spent two days at the big trees of the Mariposa grove and Yosemite Valley — Glacier Point, Mirror Lake, Camp Currey, the various falls — two days for a place deserving a month! Next, we spent four days in San Francisco. We were guests of Rolfe Folsom '18, who took us to the Del Mar Beach Club, and under whose guidance we visited Chinatown, Golden Gate Park, Cliff House, and the Fair on Treasure Island. We were entertained at Lafayette, near Berkeley, and saw the university and the bridges.

"The day-long train ride to Portland, Ore., was relieved by the sprightly Sacramento Canyon scenery, and gorgeous views of Mount Shasta at sunset. A hasty drive up the Columbia River to Bonneville Dam and ten miles beyond was followed by my business flight to Seattle and return in the afternoon. The following day was glorious — a trip around Seattle followed by a drive up Mount Rainier to Paradise Valley. These trips on the West Coast were made by private car, hired under the train-auto system. This most satisfactory service should be investigated by those planning such a trip, for it increases pleasure and ability to get around.

"On the Sunday after July 4 we took the Canadian Pacific boat to Victoria, where a sight-seeing trip and swim in a hotel pool occupied us until departure of the night boat for Vancouver. A trip around Vancouver, including views of the totem poles in Stanley Park, crowded the morning until our train started for the Rockies. All one day we enjoyed the Fraser Canyon scenery, spending the night on Shuswap Lake and resuming our journey early the next morning. We saw by daylight the scenery from Vancouver to Calgary! Emerald Lake and Yoho Valley were beautiful, but two days at Lake Louise were the high points of the trip. The unbelievable view, swims in the pool, climbs, and a boat trip made the time vanish. We glory in colored movies and stills which enable us to re-live the trip. — Come and see them, seventeeners!" — RAYMOND STEVENS, *Secretary*, 30 Charles River Road, Cambridge, Mass. PHILIP E. HULBURD, *Assistant Secretary*, Phillips Exeter Academy, Exeter, N.H.

1918

News has been very scarce this time, and I am sorry to say that all I have to report are deaths and changes in address. Henry W. Wright of Topsfield, Mass., died in April, and Harold C. McLaughlin died on November 3 in Atlanta, Ga. Thanks to the Secretary of the Atlanta Alumni Association of the M.I.T., I have received the following information from the Atlanta *Constitution* of November 4: "Harold C. McLaughlin, 47-year old Atlanta architect and one of the most active figures in the city's art circle, died . . . at Emory University Hospital. He had been seriously ill for less than three weeks, but had been in poor health for several months. A native of Sedalia, Mo., McLaughlin came to Atlanta in 1919, after serving in the construction division of the Army during the War. His first connection was with the firm of Edwards & Sayward, later joining McDonald & Company. His work with McDonald included the designing of the Union Station.

"At the collapse of construction activities during the depression he served as director of personnel for the government land survey for the state of Georgia for several years. During recent months, he had been employed by Robert & Company as an architect on one of the city's largest housing projects. More recently, he had been working in Savannah with Burge & Stevens on a military project there, but ill health forced his return to Atlanta several weeks ago. Well known in art circles here, he was one of the founders of the Studio Club, serving as its vice president for several years. He was also largely responsible for organization of the Atlanta Sketching Class, a group devoted to life study drawing."

The following are changes of address that have recently been received at the Alumni Office: Roland P. Carr, 25 Winters Street, City Island, N.Y.; Wei Y. Chiu, Number 4 Passage, 222 Route Prosper, Shanghai, China; Kun L. Chow, Passage 485, 2 Route de Sieyes, Shanghai, China; J. Alston Clark, 211 North Whitney Street, Hartford, Conn.; Philip M. Dinkins, 14 East 75th Street, New York, N.Y.; Wingate Rollins, 196 School Street, Milton, Mass. — GRETCHEN A. PALMER, *Secretary*, The Thomas School, The Wilson Road, Rowayton, Conn.

1919

In November your Secretary spent a week in Chicago at the American Petroleum Institute annual meetings, which were well attended with over three thousand men from all parts of the country. Among those attending was Walter T. Hall, with whom your Secretary had the opportunity to converse for a few minutes. Walter seemed well and prosperous and wanted to be remembered to his fellow classmates. — Information concerning the whereabouts of the following members of our Class would be appreciated: Jacob Braverman, Harold B. Butler, Charles C. Cook, and Jere Hewett Cook.

Carl L. Svenson is a professor of mechanical engineering at M.I.T. — Ralph H. Gilbert telephoned me and wondered when the '19 group in New York were going to have their dinner get-together.

1919 Continued

He had seen Freddy Given recently. — Your Secretary received a note from Charles J. Farist with the news, "still here." — Jack Fleckenstein wrote from Ionia, Mich.: "There've been no changes since I wrote you last. I wish you would drop out here in Michigan some time so that we could get together. I have an office and phone in Detroit."

George Fleming finally emerged from the world of the unheard of and dropped your Secretary a line from 95 Elizabeth Street, Hartford, Conn., but gave no news about himself. One of these days your Secretary promises to nail him to the post and give you a story of all his happenings since the last time your Secretary saw him, which was in 1921. — Best wishes for the holiday season and for a very successful New Year. — EUGENE R. SMOLEY, *Secretary*, The Lummus Company, 420 Lexington Avenue, New York, N.Y. GEORGE W. MCCREERY, *Assistant Secretary*, 131 Clarendon Street, Boston, Mass.

1921

Happy New Year! We shall duly celebrate 1941 as the year of our tremendous twentieth reunion on June 6 to 9 at an ideal spot in Connecticut well known to many of the Class. Dick Spitz has enlisted as one of the "rounder-uppers" in New York, and Sumner Hayward has come forward to offer his services in a similar capacity in northern New Jersey. Miles Zoller of Cincinnati and Fred Dadmun of Chicago promise to attend the festivities. (Fred insists on a suitable conflagration to mark a midnight escapade in which some of us participated when 1921 was on the last lap in Cambridge.) More volunteers are needed to phone local members of the Class. If you'll help, please write Ray St. Laurent at once. When you arrange your vacation schedule, don't forget to include our reunion dates.

Christopher B. Nelson, XIII, is president of the Annapolis Yacht Yard, Inc., Annapolis, Md. That his fame as a yacht designer continues is attested by recent newspaper advertising, which prominently describes a palatial 53-foot cruiser as the product of his creative ability. — George F. B. Owens, VI-A, Assistant Vice-President of the Brooklyn Union Gas Company, in Brooklyn, N.Y., has been elected vice-chairman of the industrial section of the American Gas Association. "What Is Happening to the Domestic Load and What Are We Doing About It?" was the subject of an address George made before the commercial section at its annual meeting in Atlantic City, N.J. George joined the Brooklyn company in 1930 as an industrial engineer. Shortly thereafter he was appointed domestic sales manager and later became new business manager. He served in this capacity until 1939, when he was elected assistant vice-president. He has played a leading part in the merchandising of gas appliances, a fact which should make Bill Hainsworth, V, of Servel, Inc., and others with similar interests stand up and cheer.

Tripling from Obie Denison '11 to Ray to us comes the news that William C. Ready, I, Captain in the Engineer Reserve Corps, is construction quartermaster at Fort Devens, Mass., supervising the biggest building program since World War days. Bill is directing work on process, recruit, reception, recreation, and warehouse buildings, guard house, post exchange, twenty barracks to house 1,260 men, and a cafeteria at which a thousand men may be fed at once. Prior to this appointment, Bill was for many years a civil engineer and superintendent of construction in the Quartermaster Corps, United States Army, and was stationed at the South Boston Army Supply Base.

The M.I.T. Club of Northern New Jersey fall smoker on November 14 brought out ten of the Class. We were glad to welcome Morris B. Hart, X, to the group of regular attenders. Morris lives at 48 Bellevue Street, Elizabeth, N.J., and during working hours may be found behind the door marked "Plant Manager" at the Hart Products Corporation, 1440 Broadway, New York. Besides Morris, Max Burckett, George Chutter, Cac Clarke, Phil Coffin, Asher Cohen, Sumner Hayward, Fred Kowarsky, Gus Munning, and Ralph Wetsten made up the Class contingent. George won the pool of $11.75, collected at the dinner preceding the meeting, for guessing that 173 Alumni would be present. For the benefit of others with similar intentions, be it said we were unable to borrow even five simoleons from him!

Your Assistant Secretary was honored by an invitation from Carlton E. Tucker '18 to lead an Electrical Engineering Department colloquium at Technology on November 18 and 19 for seniors, graduate students, and members of the staff. The subject was "I. T. and T. Selenium Rectifiers," covering the details of the dry plate metal rectifiers being manufactured by International Telephone Development Company, Inc., New York. We were royally entertained by Harold C. Hazen '24, head of the Department, and by his colleagues throughout a most pleasant visit to Cambridge.

Dayton T. Brown, II, has been made vice-president in charge of research for Brewster Aeronautical Corporation, which has expanded to occupy over 884,000 square feet of floor space at its new plant at Newark Airport, N.J., and in the Brewster Building, Long Island City, N.Y. Brownie's company has more than $100,000,000 of unfilled orders and is increasing its personnel.

The Register of Former Students wants to obtain the correct addresses for those for whom mail has been returned from the addresses given. Please drop a note either to the Register at the Institute or to your Secretaries if you know how to reach any of these fellows: Emil J. Bachmann, VI, 56 Fenwood Street, Roxbury, Mass.; Elmer L. W. Barry, II, XV, R.F.D. Box 134, Holliston, Mass.; John Bere, VI, 265 River Avenue, Winnipeg, Manitoba, Canada; Samuel J. Broide, VI, 59 Auburn Street, Boston, Mass.; Orrin Champlain, Jr., III, 15 Cheswick Road, Auburndale, Mass.; Winfred L. Foss, 200 Summer Street, Buffalo, N.Y.; Maurice J. Kaplan, X, 21 Wabeno Street, Roxbury, Mass.

These new addresses have been received: Dr. Daniel P. Barnard 4th, X, Dune Acres, Chesterton, Ind.; Howard L. Face, II, 41 Harvest Street, East Lynn, Mass.; Chu Ling, XVI, 22 Shih Fu Ma Ta Chieh, Peiping, China; Sherman E. Nichols, XV, 5 Crystal Street, Greenwood, Mass.; Pang-Nin Soo, X, Lane 91, 33 Edinburgh Road, Shanghai, China. — Start the year right. Write now to either or both of us and get that exhilarating feeling of having done your good deed! — RAYMOND A. ST. LAURENT, *Secretary*, Rogers Paper Manufacturing Company, Manchester, Conn. CAROLE A. CLARKE, *Assistant Secretary*, International Telephone Development Company, Inc., 137 Varick Street, New York, N.Y.

1922

The national spotlight has recently been shining on classmate A. J. Browning. Al has temporarily left his job as president of United Wall Paper Factories, Inc., to become a dollar-a-year man as representative of Donald M. Nelson, coordinator of national defense purchases in the office of the quartermaster general. Al plans for the purchasing of army supplies to make sure that wherever possible the manufacturing can be carried out by industry during slack periods. It is evident that Al's berth in the defense program is a very important one. — Also prominent in national defense activities is Fred S. Blackall, Jr., President of Taft-Pierce Manufacturing Company, Woonsocket, R.I. Fred and Thomas D. Galbraith, Commander in the British Navy, were the principal speakers at the Rhode Island dinner of the New England Conference at the Hotel Statler in Boston on November 14. Fred is vice-president of the New England Council.

Heinie Horn has written from West Orange, N. J., giving his regrets at being unable to attend Alumni Day activities. He left the National Cash Register Company in March, feeling that he had reached the time in life when a permanent assignment would be preferable to chasing around the country. At present he has completed the reorganization of the Philadelphia office of the P. C. Leonard Company. — Henry W. Coughlin has sent out notices that he has opene d a patent law office at 36 West 44th Str eet, New York. We wish him success in his new venture.

Our Class is well represented in alumni activities according to an analysis that Yard Chittick has made. Yard is our Class Representative on the Alumni Council and is also on the Committee on Assemblies. In his spare time he is also Johnny-on-the-spot whenever the Class or the Alumni Association has any work to be done. Ken Cunningham is on the National Nominating Committee for district four in Rochester, N.Y. Marjorie Pierce is president of the M.I.T. Women's Association. William H. Russell is a rep-

1922 Continued

resentative-at-large of the Alumni Council. Karl L. Wildes is the local council representative of the Technology Club of Schenectady. Percy C. Keith is an alumni member of the Visiting Committee on the Department of Chemical Engineering. Warren T. Ferguson is the Class Agent for the Alumni Fund. It is not an easy job for Warren to sign all of the letters that go out to the Class asking for support of the Alumni Fund. Each of us can help save Warren from writer's cramp by promptly making our remittance to the Fund.

Local alumni clubs depend upon many '22 men for guidance and leadership: the Albany club, on Paul N. Hillard, President; Fall River, on Robert D. Stuart, Jr., Secretary-Treasurer; Hartford, on Andrew S. LaPenta, Secretary-Treasurer; and Manila, on José C. Espinosa, Secretary-Treasurer. The Newark club depends upon A. P. Munning, Secretary; New York, on C. George Dandrow, President; Oslo, Norway, on Claus M. Thellefsen, Secretary; Philadelphia, on Philip M. Alden, Secretary; Pittsburgh, on F. Reed Dallye, Secretary; Rochester, on Kenneth M. Cunningham, President; and Washington, on William K. MacMahon, Vice-President and Executive Secretary.

Honorary Secretaries who are members of '22 are as follows: Donald F. Carpenter in Bridgeport, Conn.; William E. Huger in Atlanta, Ga.; Albert J. Browning in Chicago, Ill.; Willard B. Purinton in Augusta, Maine; Whitworth Ferguson in Buffalo, N.Y.; C. George Dandrow, Duncan R. Linsley, William H. Mueser, and Raymond C. Rundlett in New York City; Horace W. McCurdy in Seattle, Wash.; Alexander D. Ross in Montreal, Canada; and Werner Schoop in Zurich, Switzerland. — CLAYTON D. GROVER, *Secretary*, Whitehead Metal Products Company, Inc., 303 West Tenth Street, New York, N.Y. C. YARDLEY CHITTICK, *Assistant Secretary*, 77 Franklin Street, Boston, Mass.

1923

Jack Keck reports that there were ten '23 men at the meeting of the M.I.T. Club of Northern New Jersey in November. Besides Miles Pennybacker, President of the Club, those present were Tom Boyd, Clarence V. Chamberlin, Chan Clapp, Ted Edison, Doc Randolph, Jim Robbins, Charley Roche, Lem Tremaine, and Jack.

The Boston *News Bureau* recently called attention to the expanded activities of the Boston ordnance district which is under the immediate direction of James S. Crawford. The clipping calls attention to the fact that Major Crawford has been in charge for the last six years and is highly qualified by experience to carry on the new greatly expanded activities. It says further: "A native of Cambridge, and a graduate of Tufts College and the Massachusetts Institute of Technology, Major Crawford was in the Ordnance Department during the World War and then went into the arsenals. For a time he was in the Philippines and returned to the United States to become an ordnance member of the Field Artillery Board at Fort Bragg. This is the board in charge of the technical development of guns. Before his present job, he was in charge of manufacturing at Watertown Arsenal. About 52 years of age, Major Crawford is married but has no children. He keeps in condition by playing tennis."

Last July the War Department assigned a group of officers, among them Harold A. Nisley, to the Fort Knox, Ky., school and replacement center of its newly created armored force. Major Nisley, who has been on the staff of the Department of Military Science at Technology, is assigned to the armored force board there. — The movement of other military members of the Class is revealed by address changes recently reported to the Alumni Office: Alva F. Englehart from Fort Monroe, Va., to the 14th Coast Artillery at Fort Worden, Wash., with a change of rank from major to lieutenant colonel; Major Walter E. Richards from the recruiting office in Springfield, Mass., to the headquarters of the second recruiting district, Concord, N.H.; Lieutenant Commander DeWitt C. Redgrave from Annapolis to the Federal Shipbuilding and Dry Dock Company, 11 Broadway, N. Y. — José C. Bertino of the Argentine Navy has completed the furlough he was spending in the United States and recently sailed for Buenos Aires. He told me before he left that he had been able to see quite a number of classmates in and around Boston and New York.

The many who knew R. V. Burns will be interested in the letter he wrote to Pete Pennypacker. Bob is a research engineer with the government irrigation department and is located at Colombo, Ceylon. He enclosed a group photo which appeared in the *Times* of Ceylon. It was a picture of a village cultivation officers' training class, 1940, with Bob sitting in the center next to the minister of irrigation. The picture shows that the years have been good to Bob. He writes: "As I was looking over the pamphlet [of the fifteenth reunion] the first thing that struck me was the number of our classmates in the 'In Memoriam' section, a total of sixty. This seems a rather high percentage. . . . The group picture of the reunion was particularly interesting. The only fellows who do not appear to have changed very much are Fred Almquist, Jim Brackett, and perhaps Jim Robbins. All the faces certainly brought back memories of old times. Apparently a good time was had by all who attended the reunion. The questionnaire and answers were particularly spicy. I was very much interested in the answers to question 12, 'What gives you the greatest unhappiness?' The 'insecurity' connected with living in the United States was the thing that gave me the greatest unhappiness.

". . . I told you that we got the hydraulic research laboratory going and that we have plenty of problems to work on. These problems are connected with questions of flooding, drainage, and irrigation. My principal growl here is the shortage of assistants. . . . I can definitely say that there are more problems awaiting solution here than I can ever solve in the course of my life.

". . . We expect to visit the United States next year. . . . The program at present is that Lillian and I shall leave Colombo for North America early next year, traveling by way of Singapore, Hong Kong, and Vancouver. We shall probably spend April and May traveling around from place to place inspecting hydraulic laboratories, flooding, drainage, and irrigation schemes, and we hope to arrive in the eastern part of the United States about the early part of June. June, July, and August will be our vacation period, and we expect to leave North America early in September in order to reach Ceylon by the end of October. The program may of course be altered, depending on the progress of the war.

"Living in Ceylon is not too bad, especially in Colombo. We are starting to feel the need for a change, however, as the continual heat does get one down eventually. Fortunately, we have one air-conditioned room which is equipped with a 'Carrier Air Conditioner of Newark, N.J.' and this is really a life-saver. It not only gives us cool, filtered air from which the moisture has been removed, but it also eliminates the worries connected with mosquitoes, flies, and noise. Very frequently we go to the hills where it is cool all the time. From Colombo to the upcountry resorts is only a matter of one hundred miles, and there one can get almost any temperature. In January they usually have frost in the upcountry section, but as a general rule it never gets colder than 45 degrees Fahrenheit. This seems pretty cold when one has been accustomed to sweltering at anything from 80 to 95 degrees, with almost 100 per cent saturation. The temperature in Ceylon is not so uncomfortable as is the relative humidity. During March, April, and May a great number of Europeans go to the hills, as it is just too hot on the lowlands. Perhaps I should say that the hills vary in height, but anything from 4,000 to 7,000 feet above sea level is quite common.

"Colombo is a fairly modern city with a population of almost 300,000. Of these there are only about 9,000 white people. There is plenty of social life, if one likes that sort of thing, and numerous recreational facilities including swimming, tennis, golf, yachting, racing, fishing, football, cricket, hunting, and numerous clubs. There are some very good motion-picture houses which show the latest pictures. Lillian belongs to a string orchestra, and she has broadcast from the local station on several occasions. Our major recreational activities are bicycle riding and swimming. We often take the bicycles in the car upcountry and wander around the tea and rubber estates. Naturally, we prefer the back roads, where there are not so many cars and where the villages and the country are more interesting, just as we used to prefer the back roads of England and Wales. The swimming pool is quite mod-

1923 Continued

ern; in fact it was just opened last year and provides a wonderful means of keeping fit. Unless one gets plenty of exercise down here every day, one's health deteriorates rapidly.

"I think we told you about our bungalow (free of rent and taxes), a very spacious affair. In fact it is far too big for us, as we live in the cold room most of the time, and it takes too many servants to keep the house clean. We have only three servants, but many of the people around here have eight or nine. You will appreciate that in order to keep the bungalows cool they must be spacious with extensive verandas and porches. For our part we look forward to the day when we shall have a little bungalow entirely air conditioned. We have already made the plans for such a bungalow, and when we return to Ceylon after our leave we shall probably have it built. The garden is very nice and is nearly always filled with flowers. It is about half an acre in size, and it takes all of the gardener's time to look after it. Among the flowers we have some beautiful orchids. When the war started last year we converted our badminton court into a vegetable garden, and now we have plenty of vegetables including tomatoes, lettuce, spinach, egg plant, okra, and golden bantam Indian corn. We tried growing other vegetables, but some of them did not do very well — especially the root vegetables such as carrots, turnips, and potatoes. In some ways it is hardly worth while growing vegetables here, as they are so cheap, but many of the vegetables are washed in filthy water so that if one is not careful one may get almost any disease. Particular care must be taken with lettuce and tomatoes."

It sounds to us as if there were some compensations for living in the tropics. We shall expect to hear more about it when Bob is here, as we hope he will be, next summer. . . . Happy New Year! — HORATIO L. BOND, *Secretary*, 457 Washington Street, Braintree, Mass., JOHN M. KECK, *Assistant Secretary*, 207 Bloomfield Avenue, Bloomfield, N.J.

1926

A. W. K. Billings, Jr., who is a captain in the National Guard, has left Boston for Fort Leavenworth, Kans., where he will take a special training program. Bob Dean, a neighbor of Ken's in Wellesley, is likewise a captain in the National Guard and expects to be called to active duty in January. Whitney Ashbridge, who is a major in the Engineer Reserve, Quartermaster Corps, is on active duty again in the construction division, building a group of cantonments. He wrote recently from the Army and Navy Club in Washington to report that he was to be married on December 7 to Mary Gurney Naile, daughter of the late F. Raymonde Naile, Captain in the United States Navy, of Chestnut Hill, Philadelphia. By the time these notes appear the great event will have taken place, but it is not too late to present congratulations.

For the department of reproof and correction, Arthur F. Johnson recently wrote: "Please advise the esteemed Secretary of the Class of 1926, Mr. James Killian, Jr., that his note in regard to myself working for the Shenandoah-Dives Mining Company is slightly in error. I work with their organization, work through their mine workings, eat at their boarding house, live and work in their company buildings, employ their men to do mining work, but actually work for the American Smelting and Refining Company. Best regards to the Class." We are glad to have the record straight, down to the last detail. — Dr. and Mrs. James Henry Strickland announced the marriage of their daughter Reba Carolyn to Judson Biehle on August 5 at Concord, Ga. The Biehles are at home at 67 Park Terrace East, New York City. — W. R. Francis is chief operator for the Newark division of the Western Union Telegraph Company. He has been attached to the New York office since 1926, and last May received a promotion and was transferred to the Newark office. I understand that in his present position he has complete charge of all lines in the Newark district.

Elmer Warren, who is registrar of Colby College, recently stopped by, and the Secretary had a very pleasant visit with him. — Ben Richardson has an important post with the company that manufactures Electrolux vacuum cleaners. He was in town recently and talked with the Secretary by phone. — John E. McMasters is with the Plymouth County Electric Company in Wareham, Mass.

George Warren Smith has accepted the chairmanship of our fifteenth reunion committee, and is already actively at work planning this major event. Recently, at his suggestion, a call went out to a group of '26 men in and about Boston to attend a dinner meeting to discuss reunion plans. Among those who were able to come were Joe Levis, Bill Lowell, Pink Salmon, George Smith, Flint Taylor, Cedric Valentine, and Bud Wilbur. Committees and other organization details were discussed, and by the first of the year we expect that fairly definite plans will be ready for announcement. The reunion will doubtless come on the week end preceding Alumni Day on Monday, June 9. In other words, the festivities, including Alumni Day, will probably run from June 7 through June 9. Please make a memorandum of these important dates. — JAMES R. KILLIAN, JR., *General Secretary*, Room 3–208, M.I.T., Cambridge, Mass.

1927

Larry Cheney is a machine-methods and maintenance engineer for the United States Rubber Products, Inc., at the Naugatuck, Conn., footwear plant. He was married in 1932 to Alice Whitmore of New Haven, and, as Larry puts it, they have one four-year-old daughter "so far." Also in the rubber business is Tom Knowles, who has been living at the Mayflower Hotel in Washington. He lobbies, as we have previously reported, for the Goodyear Aircraft Corporation. Apparently Tom's persuasion has brought results, for I recall a recent blimp order placed by the Navy with Goodyear. As to inventions, patents, and so on, Tom reports, "I ain't done nuthin' to nobody!"

Willard Felch reports from Teaneck, N.J., that he is an engineer with the American Telephone and Telegraph Company in the overseas telephone plant department. His work concerns the operation and maintenance of the radio transmitters, receivers, and other paraphernalia used in providing telephone circuits to various United States possessions and to foreign countries. Felch married Muriel Fairchild from Quebec, P.Q., Canada, in 1936.

Elmer Andrews is now living at 5718 Winthrop Avenue, Chicago. He designs and supervises the installation of mechanical equipment of buildings, particularly film processing stations for Eastman Kodak Company. For such complicated and involved activity, he bears the title of assistant mechanical engineer. The stay of the Andrews family (Mr. and Mrs. and two sons, five and eight years old) in Chicago was expected to end on Thanksgiving, when they were to return to Rochester, N.Y. Andy reports meeting Art Connolly, patent attorney for Du Pont.

Nat Cohn is still district manager for Leeds and Northrup Company in Chicago. He was married in June to Marjorie Kurtzon of Highland Park, Ill. The Cohns are living at 731 Crafton Avenue, Highland Park. — Carl Davies crashed through with a letter in place of the questionnaire. He is located in Mobile, Ala., with Dantzler Lumber and Export Company. Having heard rumors about '27 men who are around Mobile or even traveling through, Carl asks particularly that they look him up at the office, or at home, 207 Woodlands. Perhaps Carl, in sunny Mobile, will enjoy knowing that the first snow of the year is falling as these notes are being written.

James Castner in his usual quiet manner reports from Wilmington, Del., a world of business activity in the following few words: "My pay check comes from E. I. duPont de Nemours and Company, and my title is technical assistant to director of production, explosives department, where my work concerns building and operating explosives plants." Seems like making a molehill out of a mountain. Oh, yes, he checked "not married." — The Boston *Transcript* reports the wedding of Betsy Linscott and John Keary in New York City on November 2. After a southern trip the Kearys are living in Cambridge.

Any of you who have not sent in the questionnaire will do me a great favor by mailing it right away. It won't be long before the news on hand will be exhausted. Besides, your classmates won't know what you are doing. We want them to know, so let's get together. — RAYMOND F. HIBBERT, *General Secretary*, care of Johns-Manville Corporation, 22 East 40th Street, New York, N.Y. DWIGHT C. ARNOLD, *Assistant Secretary*, Arnold-Copeland Company, Inc., 222 Summer Street, Boston, Mass.

1930

Your President, Jack Bennett, II, and your Secretary join in extending their very best wishes of the season to all members of the Class. At the reunion last June, Al Luery, VI, gave your Secretary a letter written some months before by Emilio MacKinney, VI. I have been saving it for inclusion in the notes for this particular issue of The Review. It says in part: "Thanks for your Christmas card. . . . I am sure we think of each other occasionally, especially at Christmastime, when old friends file past our memory, and we make vows to meet them again. This last year has been good to us here [Mexico]. MacKinney and Company is now well established, and as a little company we have fared better than I dared to anticipate. . . . Next year is full of question marks. . . . The world around us is on fire. Our old beliefs in right and justice are being thrown overboard. However, one thing seems clear — that honest work and good faith will still drive us on. . . . Dicky is five, and Doris will be four. Our health, fortunately, is good and with the exception of a lost tooth, I am still intact after thirty-odd years of kicking around. . . ."

In November, Bob Phelan, VII, was married to Sally Scates of West Medford, Mass., with Ken Tator and Joe Wight '32, II, among the ushers. The Phelans will make their home in Canajoharie, N.Y. The engagement of Doris Hudson of Brookline, Mass., to Charles May, VII, was recently announced. Dr. May is a faculty member of Harvard Medical School. To both classmates we extend congratulations!

Ed Rhodes, XII, is now stationed at Raritan Arsenal, Metuchen, N.J., as a first lieutenant in the Ordnance Reserves. — Dick Barnes, X, recently addressed a meeting of the American Chemical Society, Inc., at the University of Utah. Also returned from a combined business and pleasure trip to the West Coast is Scotty Scott, VI-A. While at Seattle he spoke before the Institute of Radio Engineers, Inc. — Charlie Twelves, VI-C, is president of the Technology Club of Puget Sound, which meets at Seattle. Howie Brown, XV, heads the Miami club, while the following classmates are secretaries of Alumni clubs: Hal Spaans, XV, in Harrisburg, Pa; Dick Berry, V, Indianapolis; Gerry Morse, XVI, Salem, Mass; and Ollie Green, XV, at Washington, D.C. Brown, Dick Huggard, XVII, and Heinz Vorlander, XV, are honorary secretaries of M.I.T. in Miami, Fla., Winnipeg, Canada, and Dresden, Germany, respectively. They act as representatives of the Institute in their home cities. — PARKER H. STARRATT, *General Secretary*, 1 Bradley Park Drive, Hingham, Mass.

1932

On October 31 Bill Kirkpatrick answered a letter of mine with the following news: ". . . I left the S. D. Warren Company in the spring of 1936 to come to the Allied Paper Mills as research director. Since that time changes in the technical staff have given me complete charge, and my position is now that of technical director in charge of sales service, mill control, and research. In this capacity, I am very fortunate to travel a good deal and have had several opportunities to see Carroll Wilson in Boston and also Don Gilman in Chicago. You know Don is with Sears Roebuck and Company, or was a year ago when I saw him. Last summer I had occasion to visit M.I.T., and was amazed at the perfection that has been achieved in the construction of the new Alumni Swimming Pool. It is the most perfect thing of its type I have ever seen.

"Two years ago I married Frances Wheelock Sutherland, whose father was vice-president and one of the founders of the Sutherland Paper Company, also located in the Kalamazoo Valley. We announced the arrival of a daughter last February 8, and if the election goes right this year, perhaps we will have more to show in the future. If not, I may be in the Army."

Will some of you fellows send along a similar letter? My own letter writing to solicit news of our Class is not proceeding very fast, and contributions for the notes would be appreciated. — Charles E. Locke '96 informs me that Royal B. Jackman, formerly with the United States Vanadium Corporation at Bishop, Calif., is now associated with the North American Aviation Corporation at Manhattan Beach, Calif. — Maurice Cook was married on October 6 to Annette Cohen, who attended George Washington University and Boston University. After a trip to the Midwest, the couple are making their home in New York City.

When it was reported in the December issue that Rolf Eliassen had gone to New York University, we did not know that he was to be the head of the sanitary engineering research laboratory. From a clipping we learned that he will direct the extensive sanitary land-fill investigation now being carried on for the New York Department of Sanitation. CLARENCE M. CHASE, JR., *General Secretary*, 1207 West 7th Street, Plainfield, N.J. CARROLL L. WILSON, *Assistant Secretary*, Research Corporation, 137 Newbury Street, Boston, Mass.

1933

In the New York *News Record* we read: "New Head of Textile Engineering at Texas Technological College. For the past four years, Mr. Roland L. Lee, Jr., has been in charge of the spinning research work at Texas A. & M. College, College Station. Since November 1935, he had been Associate Cotton Technologist with the Division of Cotton Marketing in the Agricultural Marketing Service of the U. S. Department of Agriculture. His particular job had been local leader in charge of the Cooperative Cotton Fiber and Spinning Research Laboratory. . . ." — From the Boston *Transcript* comes the following: "Frank F. Gilmore, formerly assistant to Prof. Erwin H. Schell of M.I.T., has been appointed to the faculty of the Katharine Gibbs School of Boston and will take up his new duties in an administrative capacity as assistant to the president." — Congratulations to you both! — We read also that Samuel S. Saslaw, XVIII, was the principal speaker at a meeting of the South Florida branch of the American Association for the Advancement of Science which was held last spring. Saslaw is assistant professor of mathematics at the University of Miami.

From the social columns we discover that on October 2 Kirtland Manley was married to Marie Anne Vassar of Rutland, Vt. The couple are living at 225 East 73d Street, New York, N.Y. Manley is associated with Humes, Buck, Smith and Stowell of 50 Broadway. — We read too of the marriage of Ralph L. Garrett and Elizabeth Forsyth of Arlington, Mass., on October 16. They are living on Mystic Valley Parkway, Somerville. — On October 13, Maurice George Green, V, was married to Beatrice T. Gould of Malden, Mass. They are living in Worcester. — If you have any news, start the year right and send it along to your Secretaries. — GEORGE HENNING, JR., *General Secretary*, Belmont Smelting and Refining Works, Inc., 330 Belmont Avenue, Brooklyn, N.Y. ROBERT M. KIMBALL, *Assistant Secretary*, Room 3-104, M.I.T., Cambridge, Mass.

1934

By clipper from England comes the announcement of the engagement of Mrs. Jeanne de Araoz to Henry Dexter Humphreys. The engagement was announced by Mr. and Mrs. John K. Contant of Heron's Wood, Windlesham, Surrey. Mrs. de Araoz is the widow of Lieutenant Juan de Araoz of the Spanish Naval Air Force. She was educated at Mont Choisi, Lausanne, Switzerland, and at the Sorbonne in Paris. No specific date was set for the wedding; so by this time Henry may be well launched upon the sea of matrimony. — Abraham Rosenfeld was married on September 20 to Ruth E. Wayner of Brookline. — The Class extends congratulations and best wishes to the newlyweds.

I pass on to you the substance of a letter from the Advisory Council on Athletics. As you remember from your student days, the undergraduates manage their own athletic program, a system that is unique to collegiate circles. The operation of the program of sixteen sports is financed from money allotted to the M.I.T. Athletic Association by the administration of the Institute. However, even with careful management there are always unforeseen emergencies which cannot be covered by the budgeted appropriation. These emergencies must be taken care of by contributions from Alumni who have an interest in Technology's athletic system. This fund is known as the Alumni Athletic Fund.

This year it is estimated that approximately $700 will be needed to take care of these emergencies. If any of you fellows remember the trials and tribulations to which your particular sport was subjected, and would like to contribute

1934 Continued

to this fund, please make your check payable to Ralph T. Jope '26, Secretary-Treasurer, Room 3–219, M.I.T., Cambridge, Mass. Your contribution, no matter how small, will be greatly appreciated.

Well, that's all, folks. If everyone will co-operate and send in a few facts that the rest of the Class may want to know, we will put this column back where it belongs. So whip out your pens right now and dash off a few masterful strokes so that next month's class notes can be much, much longer. — JOHN G. CALLAN, JR., *General Secretary*, 184 Ames Street, Sharon, Mass. ROBERT C. BECKER, *Assistant Secretary*, Chile Copper Company, Chuquicamata, Chile, S.A.

1935

We arrive at another edition of the class journal. As usual we have a few weddings to report. John Best trod the middle aisle with Elizabeth Harrisson on October 19. John is with the Bendix Radio Corporation in Baltimore, Md. He is working on production control. Jack Taft took Marcelle Perkins as his bride on the same date, October 19, in Ogunquit, Maine. Jack is working for Ernst and Ernst in Boston as an industrial engineer, which makes him somewhat of a competitor of your Secretary. The Tafts are living in Belmont, Mass.

John Rutledge has acquired a fiancée, Wilna Valentine of Northboro, Mass. No date has been set for the wedding as yet. By the time this issue of The Review is delivered your Secretary will have taken the final plunge, the date being December 27. Barbara Jane Emps is the souvenir acquired from a stay of a year and a half on Staten Island. The news is a bit old now, but it has not been reported before that Rolly Hanson and Mable Thorburn of Medford, Mass., were married last June. They are living in Arlington, Mass., and Rolly is working for the Raytheon Production Corporation, as a vacuum-tube production engineer.

Recent news of Ben Greenberg is that he is back at Tech and is living in the Graduate House. Ed Barber, who was with us in the last year, is now a major in the Army and is stationed at Washington, D.C. Dick Campbell has left the Department of Biology at the Institute and is now in the navy yard at Cavite, P.I. Jim Eng, formerly at Langley Field, Va., is now at the Springfield Armory in Springfield, Mass.

A post card from Murray Brown (a Boston Yankee, he says) informs us that he has been with Northern Pacific Railway these many years. Recently Brownie was transferred, and given a promotion, from Glendive, Mont., to Spokane, Wash. He has been made engineer in charge of the construction of a 500-ton coal dock for the refueling of locomotives. Brownie's contribution to future classes stands at two boys, one two years old and the other four.

A letter from Bill Rothen bears the news that his engagement to Roberta Hardee of Durham, N.C., was announced on October 20. Looks as if Bill fell for one of those pow'ful nice south'n gals! Bill is still holding down a desk for Hoffmann-LaRoche, Inc., in Nutley, N.J. Bill's duties include advertising and sales-promotion work for their pharmaceutical products. He is officially first stooge for the director of promotion. Bill also informs us that Charlie Bowen (whose marriage we reported some time ago) has left the General Electric Company in Bloomfield, N.J., and is now an efficiency engineer with Carnegie-Illinois Steel Corporation in Chicago. Charlie likes the work very much, but isn't very fond of Chicago. Many thanks for the letter, Bill.

Perry Ware also broke down and sent in some notes. Since June he has been working in the electrical laboratory at Simplex Wire and Cable Company in Cambridge, Mass. When we last heard from him, he was working on radio frequency measurements. Perry mentioned that Bob Greer is attracting large crowds wherever he goes because of the maze of equipment he uses in setting up gauge stations all over Massachusetts — United States Coast and Geodetic Survey equipment.

Course XVII issues an annual newsletter, from which the following items have been appropriated for the benefit of the entire Class. Ed Collins acquired a ball and chain last July 6 — the former Lorette Conlin of Pittsburgh. He is a salesman and does product-development work for the Enamel Products Company of Cleveland, Ohio. Ed says: "If some of you fellows want the low-down on one of the most promising of modern building materials, drop me a line, and I'll tell you about Architectural Porcelain Enamel." Ed, you can expect a call from your Secretary the next time he gets to Cleveland, which should be fairly soon. Vin Cook is now construction engineer with the Research Corporation in Bound Brook, N.J. He started work there last July and is expected to travel from one job to another. Larry Hall is assistant to the concrete technician at Franklin Falls Dam in New Hampshire. Bill Klehm is in the Boston concrete drafting department of Stone and Webster. As many of you know, Howard Staley is now an assistant professor in the Department of Building Engineering and Construction at the Institute. Max Wasserman is now general manager of the Wasco Flashing Company in Boston.

As for your Secretary, there is a bit of news you may be interested in aside from the marriage mentioned earlier in this column. As you may know, I am working for Dyer Engineers, Inc., industrial engineers, on wage incentives, methods improvement, and cost accounting for industry. It is the best organization of its kind, incidentally. I was stationed on Staten Island, N.Y., for a year and a half on the installation of a cost system in a dental manufacturing company. Toward the end of November a phone call came, and, as a result, I packed my belongings and left the Island the next morning. After a stay of three days in Cleveland, I started a new job in a foundry in Buffalo, N.Y. The job here is one of improving methods, time study, and the installation of a wage incentive plan. Don't let the address signed at the end of these notes fool you. Buffalo is the place I'm located. However, my address changes so rapidly in comparison with the time it takes to get class notes out to you, that I use my Wellesley Farms address to save you fellows some headaches wondering where to write. By the way, the number of letters is hardly overwhelming. How about a good many of you unlimbering the typewriter or pen for half an hour and sending in the news? Now don't say there is none. Having no weddings or job changes to report is no excuse. Let's have some of your interesting experiences, trips, hobbies, work interests, and so on. There is not a fellow in the Class who has a valid excuse for not writing; so, get on the ball. Remember, your letter will be appreciated by hundreds. Ordinarily you can please only one or two persons with a letter; here is the chance to kill many birds with one stone. Do it now before you forget. — ROBERT J. GRANBERG, *General Secretary*, care of W. C. Voss, 9 Old Town Road, Wellesley Farms, Mass. RICHARD LAWRENCE, *Assistant Secretary*, 111 Waban Hill Road North, Chestnut Hill, Mass.

1936

A big surprise awaited me when I opened my mail recently. The shock was so great that I gasped for breath and had to sit down while I regained control of myself. What was the cause of this excitement? It was a letter from our prexy, none other than John Churchill Austin, the little colonel himself. No, Jack is only adjutant of the regiment, but that's getting ahead of the story. First, he corrects my statement in the November class notes about his employment. He does work for Case-Shepperd-Mann Publishing Corporation (I had that nearly correct), but his position is that of advertising manager for *Sewage Works Engineering*, one of their four engineering business papers. Last summer he and Mrs. Austin flew to the West Coast for a two weeks' vacation. The trip was shorter than they desired because Jack had to be back for two weeks at Fort Hancock, where the 619th Coast Artillery was ordered for summer training. Jack has been adjutant of this regiment for the past year and expects orders any day now for a year's active duty. [Editor's note: Austin has received his orders and is again at Fort Hancock.] But Army or no Army, Jack promises to be on hand for our five-year reunion next June. A memorable affair is being planned for this occasion when the Class meets officially for the first time since we marched out of Symphony Hall with our diplomas. The committee, consisting of Harry Essley, Fletch Thornton, Bill Garth, and Bob Sawyer, are planning a get-together at some place near Boston. Details should be available in our next issue. Jack says that he sees Hank Cargen regularly and that Hank is keeping busy with the Pedlar and Ryan, Inc., advertising agency.

1936 Continued

The Procter and Gamble account is his chief concern. From another source I recall the picture of Hank traveling around the country this past summer signing up beautiful brides to appear in the soap advertisements.

Speaking of brides reminds us that we have added two more couples to our rolls. Winthrop Scott, II, was married on October 5 to Elva Maude Page, a graduate of the University of Minnesota and of the Stout Institute, Wisconsin. Roger LeBlanc, II, appears to be following the advice of Tubby Rogers as nearly as possible and, since he couldn't marry the boss's daughter, he chose the next of kin. LeBlanc is a heating engineer associated with J. J. Moreau and Son. His bride is the former Marjorie A. Moreau, daughter of Arthur E. Moreau. There must be some relationship! Engagements, too, are still being made by members of our Class. Among the recent ones are those of Barbara Forshew of Brooklyn Heights and Smith College to Hamilton Migel, II; Virginia Bergen to Richard B. Fox, XV; and Catherine M. Bodman of Ponca City, Okla., to Gerry McMahon. Gerry is working in Ponca City as a lubricating oil technologist for the Continental Oil Company.

Willie Anslow, V, is now studying at Cornell University Medical School in New York City. Lawrence Bosworth is at the Coast Artillery School in Fort Monroe, Va., and Larry Kanters, XV, has had the title of lieutenant added and is also in Fort Monroe. Another Army man is William Creasy, X-A, who is at the Chemical and Gas Service School at Fort Leavenworth, Kan. Ben Slom, VI, is also engaged in national defense; he is at the Portsmouth, N.H., Navy Yard. Still with General Electric is Bob Caldwell, VI-A, but he has been transferred from Schenectady to Philadelphia. George Pearson is now a pilot for Eastern Air Lines, Inc., flying out of New York Municipal Airport.

I had a short visit from Scott Rethorst, IX-B, who spent Thanksgiving with Art Zimmerman, '37. Scott's company, Vultee Aircraft, of Downey, Calif., was on strike at the time, but he was still working. Just before the plant was shut down, Scott had been sent East to look into airplane-testing equipment, and he was making a tour of equipment manufacturers and airplane factories. — Let me remind everyone of our fifth reunion next June 7 through 9. We hope to see you all there so that it will truly be a reunion. We'll have more details next month. — ANTON E. HITTL, *General Secretary*, 109 Shepard Avenue, Kenmore, N.Y. ROBERT E. SAWYER, *Assistant Secretary*, 55 Robinwood Avenue, Jamaica Plain, Mass.

1937

On November 14 the meetings of the M.I.T. Club of Northern New Jersey started with a bang; there were 167 of us at the first meeting, and '37 placed eleven that I could count. Bill Austin claims he nearly wiped off the end of my car on the way to the meeting at the Newark Athletic Club — a fine way to meet. He is living at 32 Fremont Street, Bloomfield, N. J., and is working with Westinghouse. — I couldn't get much out of Max Gerson except that Al Reinhardt is now an instructor at the Institute. Neither of us could quite picture him in a professorial mood. Max is living in East Orange, N.J., at 51 Vernon Terrace. As I was writing that, Jack Booton, who was as busy taking in all that cash as a mouse in a cheese cellar, said to me, "Gee, he lives right around the corner from me, and I didn't even know it!" Jack then told me he was at 25 Berwyn Street. — Roy Smith was as chipper as ever, and that big black stogie didn't seem to get him down too much. My suit is still hanging out trying to rid itself of the pound and a half of tar and other constituents of cigar and cigarette smoke it absorbed. — Bob Childs, Dan Hanlon, Sidney Levine, and Leon Palmer were there quaffing beer and cider; Norm Birch came from Suffern, N.Y. — Dick Gidley was there, but somehow or other he lost himself in the crowd most of the time; he is still with the Bethlehem Steel Corporation building ships.

Dick Young has written me a fine letter from Buffalo, N.Y., where his address is 90 Robie Street. Just why he is there he doesn't say, but I'm sure it isn't because of the weather; here we are still basking in the sun, while he starts his letter with the wintry blast of: "Now that old man winter has started to spread his cloak over Buffalo, we here have much time at our disposal to reflect on the past summer and to weave future patterns. During the past four or five months Phil Peters has been visiting Buffalo on an average of once a month. These visits are part of a larger itinerary which takes him to Minnesota, down Texas way, back through the South, and home — home frequently being the last stopping place after three weeks of roaming through the country. I must have mentioned this a long time ago, yet it still goes on.

"Phil surely must have seen many of the Class during his travels. [How about it Phil?] We have seen very few '37 or other Technology men. Phil Dreissigacker is active in our Navy Department, shooting off to the Portsmouth Navy Yard, or to Cleveland, or to some other place. Walt Blake, Bill McCune, and Phil Peters are active in an evening discussion group in Boston (for M.I.T. men only, I believe). George Wemple is back after his interesting trip through many manufacturing plants in the Thorne Loomis group. Art Hunt changed jobs again. He is now with Vought-Sikorsky. Jim Agnew is back in the East after a couple of years way out West in no man's land.

"I had a several-thousand-word letter from Bill Gibson. Although a '38 man, he's still a steady friend of '37. Bill is now way down in Brazil tutoring a boy who is due to enter Technology in 1941. Bill is a traveling contributor to The Review, and has letters from several leading newspaper syndicates, which should enable him to prepare many newsy and adventurous columns. . . ."

Irv Tourtellot pulled stakes from Detroit and is now with a dry-dock company in Cambridge — getting right close to home again. He and his lovely wife were here to visit us the week end of November 2. Unfortunately they could not bring their one-and-a-half-year-old son Bobbie, but had to leave him with an aunt in Providence. We certainly wish more '37 men would come to see us. — Harry J. Haflin, Jr., of Lucas Point, Old Greenwich, Conn., died on November 6. The Register of Former Students sent me the notice with no details, except that the death was recorded in the New York *Times*. — WINTHROP A. JOHNS, *General Secretary*, Route 1, Belle Mead, N.J.

1938

Lloyd Bergeson walked into an office in Building 1 and presented Dick Muther with a file of cards and a folder of notes. The next day Lloyd stepped aboard a train for Philadelphia and his new posisiton with the Cramp Shipbuilding Company. Figuratively speaking, that is just about the way your new Assistant Class Secretary took office, for Lloyd resigned when he found he was going to leave the Boston area. We are all sorry to have him go; he has done such a grand job of writing the class notes. At least we can say "thanks" to him and wish him the best of luck in his new location. — And now I suppose you want a promise of how hard I'll work in writing the notes. Well, I don't think that's too good an idea. I expect to be at the Institute and around Boston at least until June, however, and will try to do a good job.

To bring you up to date with the class marriages we report that Charlie Maak took the big step last July in Salt Lake City. The bride was Virginia Larson. Charles Haley was married to Marian Taylor at Rye, N.H., in June. After their wedding trip through Maine, they have settled in Keene, N.H. Also in July, Dean Vanderhoef married Jeanne Ann Lambert in the chapel of St. Cornelius the Centurion on Governors Island, N.Y. Dean left the Institute after one year and was graduated from West Point last June.

Other weddings reported somewhat behind schedule include those of Haskell Gordon, XVI, to Ina Evelyn Rose of Worcester; Dan Phillips to Mary Jackson of South Orange, N.J.; Ralph Werman to Bettina Dvlinsky of Brockton; and Louis Heaton to Marjorie Niles of Melrose. The Heatons now reside in Stoneham. Sumner Kalin was married in August to Agnes Saulnier of Hyde Park. They are now living in Gary, Ind. Julius Kovitz was married last summer to Sylvia Astor in Brookline.

We are late in reporting the engagement of Jim Pollock to Marvis Carlson of Bristol, Conn. Jim has been at the Institute on a teaching fellowship since graduation and received his master's degree last spring. Al Wilson, who has been working in the structural-steel business in Cambridge, has finally let us in on his secret. Carol Doty, Wellesley '39, of Wyomissing, Pa., is the girl, and we are calling it for a June wedding.

1938 Continued

Phil Sellers has moved again; yes, again since last report, but we don't know just where to this time. Ross Cooper is located in Hartford and is working with the Hartford Machine Screw Company. Bill Camp has moved farther into New Hampshire and is now with Scott and Williams, Inc., makers of knitting machinery in Laconia. Dud Levick has moved to Cincinnati to work for Procter and Gamble; Ross Teel is now in Lynn at the Champion Lamp Works; Ed McGill is in Chicago with Bucyrus-Erie.

Paul Sullivan and Nick Shoumatoff are in Bridgeport, Conn., with the General Electric Company. I had several beers on several occasions with them last summer at the University Club there. Nick spent his vacation in Cuba working on his fine collection of butterflies. Paul took the Civil Aeronautics Authority training course and has recently joined the Naval Reserve. Incidentally, a good many of the boys are now connected with the Navy. Joe Church has been called to active duty and is serving on the S.S. *Milwaukee*. Charles Henes is an engineering inspector of materials for the Navy Department. Fred Lamb should be at Pensacola by this time. I have a letter from him dated June 18 which Bergy says I'd better acknowledge. Thanks, Fred.

At last we've had a letter from Don Weir. Don was married on the West Coast, you remember, last summer. He reports that he and his wife really like southern California and that the camera business is fine. — At the Institute recently we saw Ed Hadley, Johnny Cook, and Bob Church '40. Ed is still with the Bell Telephone Laboratories in New York, and Cookie has been busy with the building of a new factory unit in Williamstown, Mass., for the Cornish Wire Company. Bob is working at the Fore River Yard of Bethlehem Steel. Mac Cross is working on an inventory and appraisal job with the Virginia Electric and Power Company.

On the week end before Thanksgiving (Boston style) some of the old gang who were still around the Institute took over the Tech Cabin. Fred Kolb, Frank Gardner, Fritz Reuter, and your new Assistant Secretary represented '38. Since Stu Paige '39 and Morrie Nicholson '39 were both there, I'll let them tell you about it. See the '39 notes. — DALE F. MORGAN, *General Secretary*, 55 Pennsylvania Avenue, Mount Vernon, N.Y. RICHARD MUTHER, *Assistant Secretary*, 180 Elgin Street, Newton Centre, Mass.

1939

Since this is the time of the year when everyone is in a festive mood but the die-hard Republicans, we have decided that the theme for these class notes shall be "sweet, snappy, and to the point." Please forgive our brevity. In this time of Christmas bells and tinsel our minds are apt to turn to thoughts of wedding bells and blondes, brunettes, and redheads. Speaking of wedding bells, we are pleased to report the marriage of Isabelle Coplon of Baltimore, Md., to Bernie Zuckerman, XV, last September. Let's also record the marriage of Dorothy Barr of Brookline to Leonard Merrill, Jr.

We learn that Ek True was made a member of the staff of the University of Oregon art school, where he is teaching construction and graphics. — Ozzie Stewart, II, has now become a lieutenant in the regular Army, having taken up his commission with the Sixty-eighth Coast Artillery.

Walt Halstead has come through with considerable news of VI-C in a course letter. Speaking for himself Walt says: "The highlight during the winter quarter here at O.S.U. (Ohio State University to the provincials who have not yet crossed the Alleghenies) was the broadcast-engineering conference, which was a two-week lecture series for engineers . . . by engineers; the attendance was about two hundred. . . . Featured were talks on frequency modulation, broadcast station measurements, microphones, and so on. During the spring quarter I took an excellent course on radiation and antenna systems, learned more on spherical harmonics, and carried on work with the matrix calculator." (Does this sound like advertising or something? asks your annotator. Don't let me stop you, Walt. Go on.) "On a trip East," he continues, "I dropped in at Tech and everything looked pretty much the same." (You ought to be around here now, Walt; you never would recognize the place. The Sloan Laboratories are almost complete; the steam lab is being roofed over to make more room for the increased activity here at the Institute; the storage battery room in Building 10 has been changed and fitted with fluorescent lights; the aeronautics building is brimming over with meteorologists; and the wind tunnel is operating about seventy-five to eighty-five hours a week. But go on, Walt. What were you saying?) "In September I went on a bike trip again, with two other assistants, into Michigan, Wisconsin, and to Chicago, where I saw Vernon Lippitt and Oggie Saunders."

We hear from Martin Lindenberg: "I am attending the Signal Corps inspectors' training course at Fort Monmouth, as a result of obtaining an appointment as a junior radio engineer with the Signal Corps office in Brooklyn. For four months previous to that I was an inspector of ordnance material in Bridgeport, Conn. Sam Hutchins, Lenny Mautner, and Charlie Friedman are also working in the vicinity. Finally and most important, I expect to announce my engagement very shortly."

Here your correspondent took a trip. In Boston he met his stooge, Morrie Nicholson, who is *still* at the Institute. Among the notable things which Morrie has done recently, are: (1) stuck his finger in an electric fan (smart boy; we call him the young Tom Edison), and (2) made a trip to Cleveland for the American Metals Congress, thus killing two birds with one stone, going to the convention and also going home for a week's vacation. While he was in Cleveland he met Charlie MacKinnon, XIV, who was exhibiting a high-speed brass-plating process which he helped develop while he has been working for Du Pont in Niagara Falls.

Your correspondent then continued his travels, accompanied by his stooge, and took a brief sojourn in the wilds of Massachusetts at a place called Tech Cabin on Lake Massapoag. (Remember the fall of 1935?) There we met with the correspondent and representative of '38 for a formal business meeting. We never did definitely decide what the business on hand was, but whatever it was we did it. Feeling that such a meeting was unusual — in fact we will go so far as to say extraordinary — we felt that it should positively be recorded for posterity through the medium of the class notes. There were many notables there, world travelers, big silent men from the West, and, as I have said before, even stooges. From the staff of the Institute there were Erling Helland and his wife (very charming), Ellwood McGee, and Richard Muther, all of Course XV. Representing '38 were Richard Muther (very versatile man), Frank S. Gardner, VIII, Frederick J. Kolb, Jr., X, and Frederic W. Reuter, Jr., IX-A; while for the great Class of '39 the representatives were William F. Pulver, XV, from Naugatuck, Conn. (who says he has a girl named Phoebe B. Beebe, who has a new canoe canal between Saugatuck and Naugatuck, Conn.), Patrick Hurley, XII, from British Columbia (actually he is a member of '40 but we claim him), James H. Laubach, Jr., XV, James L. Hall, XIX, and last, but, we hope, not least, your correspondents. This business meeting was organized by some of the hard-working graduate students. It was affectionately referred to as the Second Annual Fall Fish Fry. It was a highly successful meeting, lasting from Friday night until Sunday night. If anything has been causing you discomfort, we who have partaken of the fish fry feel that attendance there is a fine tonic. — STUART PAIGE, *General Secretary*, Box 207, Greenwich, Conn. MORRIS E. NICHOLSON, *Assistant Secretary*, The Graduate House, M.I.T., Cambridge, Mass.

1940

On November 9 Robert A. Bittenbender was married to Sara S. Cram of Waban, Mass. Mr. and Mrs. Bittenbender are living at 282 North Street, Buffalo, N.Y. Bob is employed in the Curtiss-Wright plant. Bob's brother was best man. I understand that Tony Hittl '36 and his wife have already become acquainted with the Bittenbenders. Tony was one of Course I's favorites when he was graduated, as members of that Course will probably recall.

Paul Witherell, XVII, is now working in Bethpage, Long Island, where the Austin Company is building an airplane factory for the Grumman Aircraft Engineering Corporation. Paul says the work takes "all the daylight hours except on Sunday." Being a constructionman at heart I can heartily agree with the long hours part of it. Any work which can

1940 Continued

keep men interested and happy for long hours is to be complimented. — Tom Creamer is back at 530 Beacon Street, Boston. Tommy has accepted an offer to return to M.I.T. as an assistant to Dr. Compton. His good fortune in this respect is, I am sure, pleasing to us all. Tom writes that he was often in contact with Jim Fifield, Chappie Halstead, and Dix Speas while he was in New York, and that all of them seem to be doing very well at their jobs.

Jim Fifield writes that the members of his Course are going to require a little time, apparently, and must be given a chance to fall in love or get new jobs or promotions before he can send any startling news. My goodness, Jim, what were the fellows doing for four years about the first one of these items? — Morton A. Copeland is now with the National Bureau of Standards in Washington, D.C. — George M. Wolfe is with the Wasco Roofing Company as a salesman. — Frank DeFelice is with the New England Service Company as a laboratory assistant, and William Sussman has a position as manager in his father's real estate and contracting business. — Al Beucker is "without a dull moment" at his work in the Manhattan Rubber Company.

Among the engagement announcements which have come to my attention is that of Janet Davidson to Nils M. Rosenberg, who attended Kensington College, London, England, and was graduated from Technology with us. Armana Drown is engaged to Eldred Timson, and Elizabeth Roper to John B. Simpson.

Thomas K. Kroner, who received his doctor of philosophy degree last June, is to take up duties as professor of bacteriology at the University of Colorado. He will be in the department of veterinary medicine. — One of the most interesting things about working around a shipyard is that one is so often able to see the heralded launchings. At the launching of the *President Garfield* here at Newport News I ran into Phil Morgan, Jr. Phil is being transferred to the navy yard at Norfolk. He spoke to me of Harry Sedgwick, who is employed here in the shipyards, and with whom I hope to have a long visit soon. Perhaps we can dig up more news for you fellows.

A letter from Hap Farrell tells me that "at least half of the Class have returned for graduate work." — From Mrs. E. J. Kingsbury, Jr., the former Edith Cameron, I hear that Ieoh Ming Pei "has been traveling around industrial cities, visiting factories and warehouses, and doing industrial research for future work in China." He has received the position of superintendent of construction at the York Safe and Lock Company, York, Pa., and has had charge of the construction of a machine shop and an annex to the office building. — I would, of course, welcome letters from any of you '40 men. Don't hesitate to write to me if I may be of any assistance. — H. GARRETT WRIGHT, *General Secretary*, 324 57th Street, Newport News, Va. DAVID T. MORGANTHALER, *Assistant Secretary*, The Graduate House, M.I.T., Cambridge, Mass.

Reserve

JUNE 9, 1941

for your annual trek

"Back to Tech"

for

ALUMNI DAY FESTIVITIES

Jot it down on your calendar

Today

RUMFORD PRESS
CONCORD, N. H.

"Hurry Up Now! Pa's Waiting!"

THE kitchen stove used to feel pretty good on a winter's Saturday night when the thermometer was down around zero. So did the heated flatiron in the foot of the bed. But how many of us would trade the comfort and privacy of our modern, heated bathrooms for the cramped discomfort of the wooden tub and the sting of the home-made soap? And who wants to lug out the water afterward and mop up the kitchen floor?

There are a lot more of today's home conveniences that we wouldn't trade for their counterparts of the "good old days." The electric washer, for instance, for the scrubbing board; the electric light for the messy coal-oil lamp; the furnace for the parlor base-burner.

Most of us are incomparably richer than the people of a generation ago—not so much in money, perhaps, but in the things our money will buy. And in most cases these are the products of American industry—manufactured articles that have been developed by industry, improved, made less and less expensive so that more millions of people can afford to own them.

In almost every manufacturing improvement that has made this progress possible, electricity has played a vital part. And the scientists, engineers, and workmen of General Electric, who have done so much to make electricity more useful, are still seeking ways for electricity to help in the creation of More Goods for More People at Less Cost.

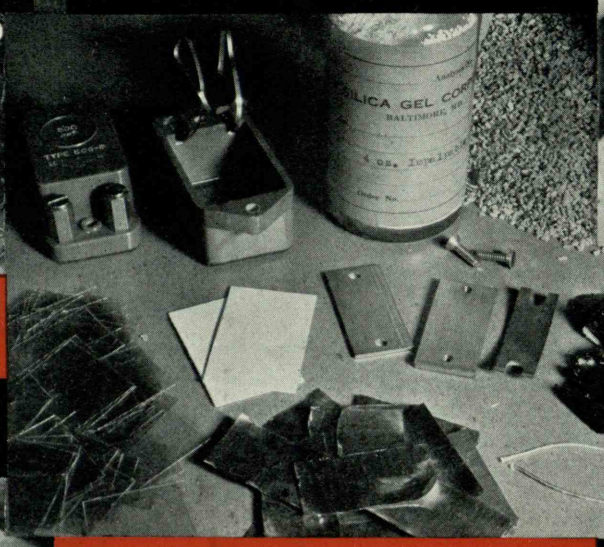
G-E research and engineering have saved the public from ten to one hundred dollars for every dollar they have earned for General Electric

GENERAL ELECTRIC

952-116C

PRECISION APPARATUS

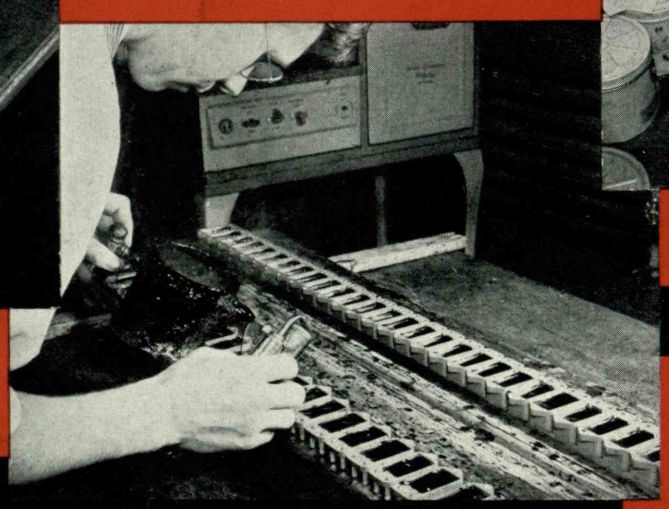
After assembly the units are aged for three heat cycles and placed in a desiccator between cycles; they are then calibrated and aged again for three cycles



A precision mica condenser in the making: low-loss bakelite case, heavy brass end-plates; heavy spring pressure-plate; selected India mica; tin foil; blotting paper; silica gel; ground cork; Ozite sealing compound; leads; assembly screws

Assembly in the Bakelite case is composed of a bottom layer of silica gel, a blotting paper pad, the condenser unit and ground cork

During assembly all parts of the condenser are maintained at 300 degrees F. to drive out all moisture; the workman has a glass shield between his face and the condenser parts both to prevent moisture from his breath reaching the parts and to hold the heat from the electric hot-plate upon which the condenser are assembled



(ABOVE) *The condensers are then sealed in a special Ozite compound mixed to give the proper relation between adhesion and melting point*

(AT LEFT) *After the compound has cooled a final layer is poured on and sealed to the sides of the case with an alcohol torch. The condensers then are tested for breakdown at 2,500 volts d.c. In the calibration laboratory, they are finally checked for capacity, power factor and d-c leakage*

SEVERAL years ago General Radio assigned an engineer to investigate the design of small fixed condensers having sufficient stability and low losses for use in precision circuits, such as beat-frequency oscillators, bridges and standard-signal generators.

The available condensers had several serious shortcomings including very poor stability with time, inexact accuracy of adjustment, high and variable power factor.

After a number of months of research, the Type 505 and Type 509 Condensers were developed. While designed primarily for use in G-R instruments, hundreds of these condensers have been sold separately for precision circuits and apparatus.

In the Types 505 and 509 Condensers selected India mica is used, each piece being carefully inspected for scratches and other mechanical defects which cause high dielectric losses. Mica, despite its excellent dielectric properties, is fairly high in its moisture absorption characteristics, a property which adversely affects its power factor. In these condensers the mica and its associated tin foil are kept at a temperature of 300 degrees F for a considerable time before the condensers are assembled, during assembly, and thereafter until sealed.

To keep the condensers dry after assembly, they are placed in a bakelite case with a mixture of silica gel and ground cork and are then sealed with an Ozite compound. The amount of desiccant sealed in is such that there can be 2,000 complete changes of air due to leakage before the desiccant will be used up.

Changes in pressure can cause appreciable changes in capacitance. In these condensers the stack is heavily loaded with a stiff spring under considerable tension to a point where the change in capacitance with pressure is very small. During assembly, each unit is carefully aged through a number of heat cycles to increase stability.

The resulting characteristics are such that these condensers make admirable secondary standards of capacitance and are of such physical form that they are readily adapted to use in precision measuring instruments. All Type 505 units are adjusted within 1% or 10 μμf whichever is larger, and Type 509 units within ¼%; the temperature coefficient of capacitance is less than +0.01% per degree C between 10 degrees and 50 degrees; the power factor of almost all of the units at 1,000 cycles and 25 degrees C is less than 0.05%; the leakage resistance in most of the units is greater than 100,000 megohms. These condensers are available in standard capacitances from 100 μμf to 1 μf at prices between $3.50 and $48.00.

GENERAL RADIO COMPANY
Cambridge, Massachusetts
BRANCHES IN NEW YORK AND LOS ANGELES

Since 1915 Manufacturers of Precision Electrical Laboratory Apparatus